STEEL RESEARCH AND MARKETS OF THE FUTURE

HEARING

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SCIENCE, RESEARCH AND TECHNOLOGY

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U.S. HOUSE OF REPRESENTATIVES

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STEEL RESEARCH AND MARKETS OF THE FUTURE

THURSDAY, AUGUST 4, 1988

House of Representatives,
Committee on Science, Space, and Technology,
Subcommittee on Science, Research and Technology,
Washington, D.C.

The subcommittee met, pursuant to call, at 9:45 a.m., in room 2318, Rayburn House Office Building, Hon. Doug Walgren [chairman of the subcommittee] presiding.

Mr. Walgren. Let me call the subcommittee to order and express my appreciation to the witnesses for coming today and joining in these discussions that we have through our Subcommittee on Science, Research and Technology on the steel industry.

The economic health of the United States clearly requires a viable and a prosperous domestic steel industry, and when United States-owned companies are successful, other industries, like construction, and manufacturing, and energy, which are dependent on high-quality and reasonably priced steel, those companies also thrive. At the same time, when the demand for domestically produced automobiles and farm equipment, pipelines, and other steel-based goods declines, the steel industry has no choice but to contract.

During the first part of this decade, recession hit the manufacturing sector, and the steel industry did contract, experiencing multibillion-dollar losses. In addition, the domestic market lost production orders to steel imports from foreign companies and faced greater competition from new materials and new kinds of composites.

For the five-year period from 1982 to 1986, steel producers lost $12 billion, two of the major firms filed for Chapter 11 bankruptcy, and the balance sheets of domestic steel companies certainly had to increase their debt, and the problems of meeting rising pension costs resulted in very real economic stress.

As a result of these declining profits, the industry drastically cut back its research and development efforts, and the immediate future of the domestic steel industry at that time looked dark. But, as in all things, particularly in steel, this is a cyclical industry, and in the last several years the domestic industry has turned around, and certainly for the immediate short term things look much brighter.

By taking the necessary steps to improve the quality of its products and to modernize its capital equipment and to increase efficiency, this steel industry was able to move again into a profitable situation. A weaker dollar, import restraints, and an abundance of orders from a domestic economy that has been recovering have helped the steel industry move into better times.

By reducing capacity, the U.S. steel industry has become substantially more efficient and has been able to increase their profits. Some domestic producers have diversified into nontraditional markets: railroad ties, highway superstructures, oil drilling, and other American steel makers are ready to explore markets at this point even overseas.

This subcommittee continues to be concerned about the long-term viability of the U.S. steel industry. The subcommittee played a major role in developing the Federal Steel Initiative Research and Development Program, and we are pleased to see that that program is at least getting under way. The American Iron and Steel Institute has developed a proposal for an industry-Government research venture that will be submitted to the Department of Energy under the Federal Steel Initiative soon, and we have great hopes that there is a contribution that can be made from the Federal level. But certainly the industry itself and its own efforts in research and development will be critical to the future.

I have been struck by the fact that the Federal Government funds more research and development in our society than is apparent on the surface, and certainly that is understandable when you think of basic research where there is not an immediate ability to foresee particularly products that could be marketed, but when we look at our society as a whole and see the Federal Government funding literally 50 percent of the total research and development that we can identify in our society, and when it comes to basic research an even higher percentage, and when we look at the fact that the two economic sectors that have been world leaders without challenge in our economy—agriculture and aerospace—and realize that from the beginning in those two industries the most unusual characteristic was that there was always an accepted traditional role of governmental support of research, and certainly they have prospered in large measure because of the research effort that has been made that has moved them continually into new products and into innovation that has resulted in very vibrant American industries.

Certainly Government has a role to play in the support of research and development in the steel industry as well. We put particular demands on the steel industry. In many ways, some of the difficulties the steel industry had in the seventies was a result of the tremendous burden of environmental controls that were imposed on them, and, as a result, under President Reagan, the President's science adviser, Jay Keyworth, in the earlier years of the administration recognized that there may very well be a reason for the Federal Government to try to encourage the development of new steel-making technologies that would substantially increase efficiency, and given the new developments in technology, there are certainly resources in the Federal laboratories and with new technologies that go into quality control and the like, there is a contribution that Federal support of research, together with the private sector, could make that may be critical to the steel industry.

These are sort of the areas that we would like to explore this morning, and I want to express my appreciation to the witnesses that we will have. We are looking for guidance in the direction that the Federal Government may or perhaps should not take in these next several years. The Congress has provided about $13 million in appropriated funds to the Federal-private sector steel initiative through the national laboratories. Very little of that has been committed.

It is a difficult job to commit research and development funds effectively, and it certainly is most important that whatever funds are committed they be committed wisely, and yet when we look at what is going on aboard and see the investment in research made in the Japanese economy essentially by a government-orchestrated effort, we realize that we have got to be sure that we are advancing as rapidly, and fortunately we have organizations like the American Iron and Steel Institute that can be the umbrella under which we can do some things together that we hope will keep us in the forefront of steel technology, so we are taking second seat to no one.

Let me call for our first witnesses Richard Simmons, the chairman and chief executive officer of Allegheny Ludlum Corporation, and Tom Graham, the president of the United States Steel Division of USX—if you folks would come forward—and let's start with Mr. Graham who is here in his capacity as chairman of the American Iron and Steel Institute.

As you know, gentlemen, written statements will be made part of the record and reproduced in the form that you submit them, and you can feel free to pull from a statement, or emphasize, or underscore, or diverge from it in any way that you feel would be good to underscore the points that you would like to make.

So welcome to our process, and we look forward to your testimony.

Mr. Graham.

STATEMENTS OF THOMAS C. GRAHAM, PRESIDENT, USS DIVISION, USX CORPORATION, AND CHAIRMAN, AMERICAN IRON AND STEEL INSTITUTE, PITTSBURGH, PENNSYLVANIA; AND RICHARD P. SIMMONS, CHAIRMAN AND CEO, ALLEGHENY LUDLUM CORPORATION, PITTSBURGH, PENNSYLVANIA

Mr. **Graham**. Thank you, Congressman Walgren.

I have submitted a full statement, and I won't read that now; I'll brief it though and then be prepared to take questions and engage in dialogue with you and your colleagues.

I am Thomas C. Graham, president of USS Division of the USX Corporation and chairman of the American Iron and Steel Institute. We appreciate your invitation to present our views on what steps the Federal Government should take to ensure the technological superiority of the domestic steel industry.

I should begin by taking on two widespread myths. The first is that the importance of steel is declining. The second is that the domestic steel industry has down-rated research and technology development when, in fact, we are engaging in it more appropriately and efficiently than ever before, though perhaps not to the extent we would desire.

The unvarnished truth is that steel remains the most important engineering material in our society, and nothing indicates that will change in the balance of this century or the beginning of the next. That will become even more evident as this country rebuilds its infrastructure, as inevitably it must.

Historically, consumption of tonnage has been the indicator of the role of steel in the economy, but tonnage no longer tells the whole story. The development of more efficient design systems together with vastly superior grades of steel has moved the emphasis from tons to quality and from cost to value added.

Let me illustrate. The Eiffel Tower required 9,500 tons of steel when it was built 100 years ago. Today, we would duplicate it with about 3,000 tons. Does this reduction in tonnage represent a decline in steel usage, or is it, rather, a sign of the great progress being made?

Collaborating with customers and suppliers, the steel industry is developing products that go far beyond the usual role of raw materials and function as engineering components to reduce the cost of production for steel users. Notable among these collaborations is the automotive-steel partnership. Auto makers and steelmakers are working together to find ways of making steel a more efficient material in the manufacture of cars and trucks. There are many other examples.

A collaborative venture especially worth noting is the Steel Resource Center in Evanston, Illinois. It brings university talents together with specialists from the steel industry and steel-using industries.

As noted, the collaborative approach is producing outstanding results in the area of product development and application. Those are areas in which we do not see a need for Government assistance. The kind of research which we do seek Government involvement in is exemplified by the proposal submitted by AISI to the Department of Energy last week.

Confronted with increasingly demanding environmental constraints, we are obliged to seek a cost-effective alternative to the coke oven/blast furnace/basic oxygen furnace system. To this end, we delivered a proposal to DOE under the terms of the Steel Initiative to begin development of a direct steel-making process. This is a high risk undertaking for which Government support is necessary and appropriate.

In addition to Government actions bearing directly on steel research, we need actions that will provide an environment in which the industry can enjoy a sustained period of recovery during which to fully modernize. We do not lack the know-how and we don't lack the will to do that job; we do lack the capital.

Last year was the industry's first year of profitability since 1981. Its net income was about $1 billion, but the industry invested $1.2 billion. Nevertheless, we haven't invested enough by a long shot if we are to cope with foreign producers with whom we have competed at a distinct disadvantage.

During the past decade, there has been no economic justification for building an entirely new integrated mill in the U.S.A. We have, therefore, frequently been in the frustrating position of having abundant knowledge in regard to new technology but having no practical or economic way of grafting it on to our existing facilities. Whenever new capacity is added, we upgrade the technology.

Countries that are often recognized as having superior technology are the countries that have been able to expand their capacity, most notably Japan whose government targeted steel exports and where exchange rates greatly aid the economics of expansion.

The industry has to have the cash flow that can be used to finance the needed investments. To create that condition, we need the following public policies. In the matter of new environmental initiatives, we need an approach based on striking a proper balance between costs and results. We need extension of the VRA program. By helping to reduce steel import penetration from the 30 percent range of 1984 to about 21 percent today, the program has created a modicum of market stability and helped to arrest the process of self-liquidation in which our industry was engaged.

The international conditions that gave rise to the VRA program—that is, foreign government intervention, foreign trade practices, and world-wide excess capacity—have not disappeared. They will plague us again if the VRA program is allowed to lapse and, most disastrously, in periods of downturn in demand that inevitably occur.

In closing, if our market is relieved of illegal trade, steel industry research and development will flourish, our customers will prosper with low-cost steel supplies, our equipment supplier base will be restored, and the Nation will benefit from a renaissance in this basic engineering material.

Thank you for the opportunity to appear today, and I look forward to your questions.

[The prepared statement of Mr. Graham follows:]

Statement of

Thomas C. Graham
President, USS, Division of USX Corporation
and
Chairman, American Iron and Steel Institute

Before The

Subcommittee on Science, Research and Technology
Committee on Science, Space and Technology
U.S. House of Representatives

August 4, 1988

I am Thomas C. Graham, President of the USS Division of the USX Corporation and Chairman of the American Iron and Steel Institute. I am here today in the latter role, speaking for companies accounting for over 80 percent of the raw steel produced in the United States.

We appreciate your invitation to present our views on what steps the Federal Government should take to insure the survival and technological superiority of the domestic steel industry. In the back of my mind, I have an image of Governor Bill Clinton at the recent Democratic convention, so you can be sure that I will be brief.

I want to begin by taking on and demolishing two myths that have emerged in some quarters in recent years. The first fallacy is that the importance of steel is declining. The second is that the domestic steel industry has downrated research and technology development when, in fact, we are engaging in it more appropriately and efficiently than ever before--though not to the extent we desire.

The unvarnished truth is that steel remains the most important engineering material in our society, and nothing indicates that will change in the balance of this century or the beginning of the next. Rather, all signs point to steel, on its own and in combination with other materials, continuing to play a vital role in the life of our nation--in manufacturing, in construction and in transportation. That will become even more evident as the country rebuilds its infrastructure, as inevitably it must.

And as Secretary of Defense Carlucci recently said, steel is essential to our national security.

Steel has retained its importance because of the ways its producers have responded to changes in our society.

Historically, the consumption of tonnage has been popularly regarded as the indicator of the role of steel in an economy. But tonnage no longer tells the whole story. In fact, it can be downright misleading. The development of more efficient design systems, together with vastly superior grades of steel, has moved the emphasis from tons to quality and from cost to value added.

Let me illustrate what I mean.

As a response to the urgencies of energy conservation, automobiles have been downsized. But because of improvements in steel, it continues to represent--as it has for many years--more than 55 percent of the total weight of an average car. That represents a triumph over competitive materials seeking to displace steel.

In the last decade, the amount of steel required for containers has decreased 25 percent with a significant improvement in quality.

The Sears Tower, the world's tallest building, required far less steel to erect in 1974 than it would have in 1960, 33 pounds per square foot versus 85 pounds...and today it would require still less.

The Eiffel Tower required 9500 tons of steel when it was built 100 years ago. Today, if it were built, we would use about 3,000 tons of steel. Does this reduction in tonnage now required represent a decline or is it rather a sign of the great progress being made.

Collaborating with customers and suppliers, the steel industry is developing products that go far beyond the usual role of raw materials and function as engineering components to reduce the cost of production for steel users, making them more competitive in their markets.

Notable among these collaborations is the Automotive Steel Partnership. Spearheaded by the American Iron and Steel Institute, it has become a model of supplier-customer cooperation in American business. Automakers and steelmakers are working together to find ways of making steel a more efficient material in the manufacture of cars and trucks.

And it's producing results. For example, the rejection rates for poorly manufactured steel panels is now below one percent, down from three to six percent just a few years ago. Last fall, here in Washington, General Motors' Chairman Roger Smith predicted that "steel will remain the dominant material in autos through the 1990s...despite immense pressure from alternative materials."

As with so many things, the industry research efforts have been hampered in recent years by a lack of adequate funding. In that environment, we opted for collaboration as the most effective approach to putting extremely limited resources to work.

Starting back in 1982 with four sensor development projects, AISI evolved a process through which available resources could be leveraged by the active participation of suppliers, customers and even competitors. In several projects, the synergistic benefits have been even more valuable than the additional funding.

A collaborative venture especially worth noting is the Steel Resource Center in Evanston, Illinois. A partnership between the American Iron and Steel Institute and Northwestern University, it brings university talents together with specialists from the steel industry and steel-using industries. One of the main objectives from the beginning has been to make the Center a seedbed for customer-supplier collaboration in research projects, and that's being accomplished.

Responding to global realities, our research has been primarily directed at competitiveness versus foreign sources and competing materials.

As noted, the collaborative approach is producing outstanding results in the areas of product development and application. Those are areas, therefore, in which we do not see a pressing need for government assistance. It is not our policy to accept dollars from government simply because they are there.

The kind of research for which we do seek government involvement is exemplified by a cost-sharing proposal submitted by AISI to the Department of Energy last week.

Confronted with increasingly demanding environmental constraints, we are obliged to seek a cost-effective alternative to the coke oven-blast furnace-basic oxygen furnace system. To this end, we delivered a proposal to DOE under the terms of the Steel Initiative to begin development of a direct steelmaking process. This is a high risk undertaking for which government support is necessary and appropriate.

Through your efforts, the House has provided the foundation for this project, and additional support for it is contained in a bill recently introduced in the Senate.

In addition to government actions bearing directly on steel research, including tax policies that encourage research and development spending, we need actions that will provide an environment in which the industry can experience a sustained period of recovery from the beating it took through most of this decade, primarily because of an overvalued dollar and lack of import restraints.

When it comes to developing and implementing new technology, our steel industry does not lack know-how and will. Our accomplishments of the last several years document that.

We do lack the capital with which to fully modernize and be internationally competitive.

During the the 1982-1986 period, the worst in the industry's history, it invested almost 8 billion dollars in modernization, that despite the fact that its cash flow was less than four-and-a-half billion and its losses totaled almost 12 billion dollars. Last year was the industry's first year of profitability since 1981. Its net income was a billion dollars, but it invested $1.2 billion.

Nevertheless, we haven't invested enough--by a long shot--if we are to cope with foreign producers with whom we have competed at a distinct disadvantage.

During the past decade, there has been no economic justification for building an entirely new integrated mill in the U.S.A. We have, therefore, frequently been in the frustrating position of having abundant knowledge in regard to a new technology but having no practical or economic way of grafting it on to our existing facilities.

It is very difficult to economically justify the replacement of existing steelmaking facilities with technologically superior facilities when in the process of downsizing. Whenever new capacity is added, we always upgrade the technology. Countries that are often recognized as having superior technology are the countries that have been able to expand their capacity, most notably Japan, whose government targeted steel exports, and where the exchange rates greatly aid the economics of expansion.

That brings me to another aspect of steel industry recovery. Encouragement of domestic steel production will also have the effect of restoring the steelmaking equipment industry in this country. That industry has been devastated in the wake of the contraction of the basic steel industry. Great companies, once the standard for the world, have either gone out of business or been deeply crippled by events of the past several years. The business required to sustain a healthy domestic equipment supply industry has been severely constrained by steelmakers' loss of markets to imports and, throughout most of the period, by an overvalued dollar. The steelmaking equipment industry is an important component of this country's manufacturing base. We all have a stake in it surviving and flourishing.

Returning to the capital investment problems of the basic steel Industry:

The industry has to have the cash flow that can be used to finance its needed investment or leverage external financing for it. And it has to have reasonable expectations that the market will absorb the output resulting from such investments.

To create that condition, we need the following public policies:

In the matter of new environmental initiatives, we need an approach based on striking a proper balance between costs and results. Of particular concern at this time are proposed amendments to the Clean Air Act. Unsoundly conceived, they could add at least $800 million a year to our costs without adding significant further protection to human health and the environment.

Particulate emissions to the air from steel plants already have been reduced by over 95 percent, and the pollutants we discharge in waste water are being controlled to an even greater degree--over 98 percent. The costs to accomplish that have been staggering. We have invested over $6 billion in environmental control facilities and are spending a billion dollars a year to operate those facilities.

We need energy transport policies that enable steel producers and other industrial users to purchase fuels at competitive rates. And we need tax laws that encourage fixed investment not only in steel, but in manufacturing generally.

Finally, but at the top of the list, we need extension of the VRA program. Along with the lower value of the dollar, it has been crucial to our restructuring and modernization efforts. By helping to reduce steel import penetration from the 30 percent range of 1984 to about 21 percent today, the program has created a modicum of market stability and helped to arrest the process of self-liquidation in which our industry was engaged just a few years ago.

In addition to being extended, the VRA program should be enlarged to include additional major steel-producing countries.

The international conditions that gave rise to the VRA program; that is, foreign government intervention, foreign unfair trade practices and worldwide excess capacity, have not disappeared. They will plague us again if the VRA program is allowed to lapse and most disastrously in periods of downturn in demand that inevitably will occur.

In closing, if our market is relieved of illegal trade, steel industry R&D will flourish, our customers will prosper with low-cost steel supplies, our equipment supplier base will be restored, and the nation will benefit from a renaissance in this basic engineering material.

Mr. WALGREN. Thank you, Mr. Graham. We appreciate that statement.

Now we will turn to Mr. Simmons.

Mr. SIMMONS. Thank you, Mr. Chairman.

Much of what I will say today is really a follow-on to what Mr. Graham has already said, but I do represent a somewhat different segment of the steel industry.

My name is Richard Simmons. I am chairman and chief executive officer of Allegheny Ludlum Corporation. I am also chairman of the Executive Committee of the Specialty Steel Industry of the United States, an association representing U.S. producers of stainless, heat-resistant, electric steel, tool steel, and special alloy steels.

I am pleased to be here today representing a company as well as my industry that, by any objective standard, is profitable, competitive, and technologically advanced, and, at the same time, poised and ready to enter a future that can bring future growth, enhanced competitiveness, and even greater profitability.

Allegheny Ludlum, with sales that should exceed $1 billion this year, is the largest free-standing specialty steel company in the United States and perhaps the world. Unlike other metals, specialty steel markets have grown consistently over the past 25 years, particularly with respect to our most important product, stainless steel.

For example, in the stainless steel sheet and strip market, the largest product line in the industry, we have witnessed growth in every five-year period since 1961, beginning with an average annual tonnage of 403,000 tons in that first five-year period ending 1965 and culminating in an annual average of 829,000 tons in the period ending 1985, and, moreover, over the past two and a half years the market for stainless steel sheet and strip has grown by over 25 percent, reaching a record of over 1 million tons last year. This is illustrated in attachment one of our submission.

One of the reasons for the specialty steel industry's success is evidenced in the attached chart which graphically depicts the substantial gap between the price of stainless steel and other competitive materials. This is shown in attachment two. That gap has enabled our products to become materials of choice throughout the industrial economy at the expense of other materials, and it has been achieved largely through technology development.

The key to low prices is low costs, and the key to low costs is technology and productivity improvements. The strategy of the specialty steel industry is keyed to those two objectives. Let me provide a specific example. From 1982 through the first quarter of 1987, Allegheny Ludlum's unit volume increased 64 percent while the total labor hours worked increased by only 16 percent. In the first quarter of this year, Allegheny Ludlum shipped 13.5 percent more units of volume than we did in the first quarter of 1987, and yet we worked no more labor hours. Such productivity gains transcend every aspect of our operations and are at the heart of the profitability gains that we have experienced during this period.

The struggle to remain productive and competitive in any industry, however, is a continuous process and the driving force behind that process has been and will continue to be technology and technology development. Allegheny Ludlum is no exception to this rule.

We produce over 300 combinations of stainless steel, high-temperature alloys used in applications such as jet engines and the electronic field. We produce them efficiently and profitably, and we are able to do this because of the major technological developments that have occurred in this industry over the past 30 years.

Let me spend just a moment and focus on some of these technologies. There have been four technological breakthroughs that have occurred in the specialty steel industry since 1950 that have revolutionized the production of specialty materials and have driven this industry to preeminence in the world-wide market for materials. I should point out that all four of these breakthroughs were either invented or developed in the United States.

The first, the consumable vacuum melting process, provided the solution to the metallurgical problem of solidification control in very high performance alloys. Without it, many products we take for granted would not exist, at least with anything approaching the efficiency that is necessary for practical application. The jet engine is the best example of an application that was possible only as a result of the invention of the consumable melting process.

The second technology, the vacuum induction melting process, provided designers a degree of precision and purity to improve the performance of their products. The combination of these two technologies made it possible to produce alloy systems possible no other way.

Now it is important to understand that these two technologies that I have described did not produce cost efficiencies, they were significant in their impact because there was then and now no other technique available to achieve the properties, the level of purity, and the reliability required in the production of specialty materials demanded for these applications.

Initially, costs of manufacturing using these technologies were much higher than conventional materials, but the opportunities provided by the invention, development, and implementation of these technologies far exceeded the added cost.

Concurrent with these two developments were two technology developments which had a substantial effect on manufacturing costs and productivity in the manufacturing of existing specialty materials such as stainless steel, the Argonne oxygen decarburization process and the application of continuous casting to stainless and specialty steels. These two processes created such great economic benefits that materials producers world-wide could not survive unless they adopted the technology. From the time of its invention in the United States—I repeat, the United States—and the first application on a pilot plant basis in 1968, it took only ten years for the entire U.S. specialty steel industry to install this new technology.

As a spin-off, this technology has improved the consistency of manufacture, lowered levels of impurities, and, in general, permitted computer-assisted production of higher quality materials at low cost, to the benefit of all of the users of our products.

The second cost-saving development was the application of continuous casting to stainless and specialty steels. Learning to convert the many grades of stainless from liquid to solid slab in one step was a difficult technology task, but it provided significant additional economies. It made stainless steel more competitive with other materials.

These two cost-driven technologies have permitted us to produce stainless steels low in impurities and, at the same time, have opened up opportunities for the production of entirely new alloys with unique properties at very low cost. The stainless steel exhaust system recently introduced for your automobile is an example of the kind of spin-off development.

All of these technologies have had such an impact that demand for stainless steel has nearly tripled since 1960, and it has set records for demand in three of the past four years.

The resultant cost reductions permitted restraint in price increases to one-third the rate of inflation and one-third the price inflation of competitive materials for the past 21 years. But these technologies are expensive, and they are possible only if there are profits available to fund them. Let me repeat—possible only if there are profits available to fund them.

Technology continues to be a vital force in the specialty steel industry. Our long standing commitment at Allegheny Ludlum to research and development was supported last year by an investment of 3.6 percent of our total sales, over $31 million, far above industry levels. More than 400 people, over 20 percent of all of our salaries employees, are employed in these technical areas.

We know that technology development is an evolutionary process of development, implementation, and improvement over long periods of time and that we must build on these technologies. As we install them, we must refine them, and we must improve them. We intend to carry this process into the future.

But while I have painted an optimistic picture for the future and while our markets are growing, I would be remiss if I did not discuss the future of my company and the specialty steel industry as a whole and not mention the one issue that still concerns us, namely, the fact that we still must compete with companies throughout the world that are not subject to the disciplines of the marketplace. We should not let the current prosperity that we enjoy lull us into thinking that the world has changed.

The specialty steel industry has been forced to compete against companies throughout the world which have not had to earn a profit for long periods of time, and I draw your attention to attachment three, and the headline is that "Usinor Sacilor"—the nationalized French steel company—"eyes profit after 13 years in red."

These are not companies which are more productive, or more efficient, or more technologically advanced than the specialty steel industries, these are companies which have the financial strength of their governments behind them.

The specialty steel industry over the past 20 years has proven injury under anti-dumping and countervailing duty laws under Section 201 escape clause cases and under Section 301. Unfortunately, the laws as they are presently written and administered impose no penalty for past violations. Penalties imposed are all prospective. The laws do not compensate the victim for lost profits, lost employment, lost opportunities to grow, and, the focus of these hearings, lost investment in technology which could improve our competitive position even further. The 20-year battle that we have waged illustrates clearly that even efficient, productive, technologically advanced firms can be driven from the marketplace by less efficient, less technologically advanced if they have the financial power of their national governments behind them.

I believe it is important to recognize the answers to the questions posed by this panel: Can we provide the future products and processes our customers will need in the years ahead? and is the specialty steel industry's research capability keeping up with foreign competition? The answer is clearly yes, but, make no mistake, the answers to your important questions will be affected and determined by the trade policies implemented by our governments in future years.

As you know, Mr. Chairman, I have participated in this debate for over 15 years. In that debate, I have represented an industry which, in the President's own words, has been victimized by persistent overproduction, some of it subsidized, as well as trade barriers and distortive practices used by our trading partners to protect their domestic industries and to stimulate exports.

This aspect of our international trade must be dealt with by our Nation, and specifically our Government, in the coming years. Otherwise, even the most competitive among us may be placed in jeopardy.

In sum, while I have this morning dealt with the internal reasons for our success, I close by underscoring that these critical external factors over which we have no control continue as critical issues, and, if not dealt with, they will turn our success into failure.

If there is a proper role for the Government in the future of the U.S. steel industry, specifically the specialty steel industry, it is to ensure that these external factors do not undermine our successes. We do not ask for hand-outs, we do not want subsidies, we have amply demonstrated that we can generate the capital necessary to invest in our future on our own, whether it be technology or equipment.

We do ask, however, that our Government take an active role in ensuring that our markets are not depressed by the products of foreign producers sold at prices made possibly only because their government funds their losses. If the U.S. Government does nothing about these practices, the technological and productivity gains in the specialty steel industry over the past two decades will be for naught.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Simmons follows:]

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

SUBCOMMITTEE ON SCIENCE, RESEARCH, AND TECHNOLOGY

U.S. HOUSE OF REPRESENTATIVES

TESTIMONY OF

RICHARD P. SIMMONS

CHAIRMAN AND CHIEF EXECUTIVE OFFICER
ALLEGHENY LUDLUM CORPORATION

and

CHAIRMAN, EXECUTIVE COMMITTEE
SPECIALTY STEEL INDUSTRY OF THE UNITED STATES

August 4, 1988

Washington, D.C.

Mr. Chairman:

Good Morning. My name is Richard P. Simmons. I am Chairman and Chief Executive Officer of Allegheny Ludlum Corporation, a world leader in the technology and production of specialty materials. Also, I am Chairman of the Executive Committee of the Specialty Steel Industry of the United States, an association representing U.S. producers of stainless and heat resisting steels, electrical steel, tool steel, and special alloy steels. I am pleased to be here today representing a company, as well as an industry, that by any objective standard is profitable, competitive, and at the same time, poised and ready to enter a future that could bring further growth, enhanced competitiveness, and even greater profitability.

Allegheny Ludlum, with sales which should exceed one billion dollars this year, is the largest free-standing specialty metals company in the United States, and perhaps in the world. Unlike other metals, specialty steel markets have grown consistently over the past 25 years, particularly with respect to our most important product, stainless steel. For example, in the stainless sheet and strip market, our largest product line, we have witnessed growth in every five-year period since 1961 beginning with an annual average of 403,000 tons in 1961-1965; and culminating in an annual average of 829,000 tons during the period 1981-1985. Moreover, over the past two and one-half years, the market for stainless sheet and strip has grown by over 25 percent, reaching a record 1.01 million tons in 1987 (Attachment 1).

One of the reasons for the specialty steel industry's success is evidenced in the attached chart, which graphically depicts the substantial gap between the price of stainless steel and other competitive materials (Attachment 2). That gap has enabled our products to become materials of choice throughout the industrial economy, at the expense of other materials. It has been achieved largely through technology development.

The key to low prices is low costs and the key to low costs is technology and productivity. The business strategy at Allegheny Ludlum and most specialty steel companies is keyed to those two objectives. Let me provide an example. From 1982 through the first quarter of 1987, Allegheny Ludlum's unit volume increased 64 percent while labor hours increased by only 16 percent. In 1987, volume increased 14.8 percent more than in 1986, and it was accomplished with only 0.2 percent more labor hours. In the first quarter of 1988, we shipped 13.5 percent more than we did in the first quarter of 1987, and we worked no more labor hours. Such productivity gains transcend every aspect of our operations and are at the heart of our profitability gains during the period.

The struggle to remain productive and competitive in any industry, however, is a continuous process, and the driving force behind that process has been, and will continue to be, technology. Allegheny Ludlum is no exception to this rule. We produce over 300 combinations of stainless steel, high temperature alloys used in such applications as jet engine and electronic alloys. We produce them efficiently and profitably, and we are able to do so because of the major technological developments that have occurred in this industry over the past thirty years.

Let me spend a moment and focus on some of these technologies. There have been four technological breakthroughs since 1950 that have revolutionized the production of specialty materials, and have driven this industry to prominence in the world-wide market for materials. The first, the vacuum consumable melting process, was a technology spinoff which provided the solution to the metallurgical problem of solidification control. Without it, many products we take for granted would not exist — at least with anything approaching the efficiency that is necessary for practical application. The second technology, the vacuum induction melting process provided designers a degree of precision and purity to improve the performance of their products. Further, the combination of these two melting technologies made it possible to produce alloy systems in large sections.

It is important to understand that both vacuum melting processes did not produce cost efficiencies. They were significant in their impact because there was, then and now, no other techniques available to achieve the properties, the levels of purity and the reliability required in the production of specialty materials and demanded by the market place. Initially, costs of manufacturing such materials were much higher than conventional materials. But, the opportunities provided by the invention, development and implementation of these two technologies far exceeded the added cost.

Almost concurrent with the development of the two technologies, however, were two technology developments which had a substantial effect on manufacturing costs of existing specialty materials such as stainless steel — the AOD (argon oxygen decarburization) process, and the application of continuous casting to stainless and specialty steels.

The AOD refining process created such great economic benefit that materials producers, world-wide, could not survive unless the technology was adopted. From the time of its invention in the U.S., I repeat, the U.S., and first application on a pilot production basis in 1968, it took only 10 years for the entire U.S. specialty materials industry to install this new technology. And as a "spin-off", this technology also improved consistency of manufacture, lowered levels of impurities and, in general, permitted computer assisted production of higher quality materials — at low cost.

The second cost-savings development was the application of continuous casting to stainless and specialty steels. Learning to convert the many grades of stainless steel and other specialty materials from liquid form to a solid slab in one step provided significant additional economies. It made stainless steels more competitive with other materials such as aluminum, brass, and coated carbon steel.

With further development, these two cost-driven technologies have permitted us to produce stainless steels low in impurities, and at the same time, have opened up opportunities for the production of entirely new alloys with unique properties at low cost. The stainless steel exhaust system recently introduced for your auto is an example of this kind of "spin off" development. These technologies have had such impact that demand for stainless steel sheet and strip nearly tripled since 1960, and set records in three of the past four years. The resultant cost reductions also permitted restraint in price increases to one-third the rate of inflation and one-third the price inflation of competitive materials for the past 21 years. But these technologies are expensive, and possible only if there are profits available to fund them.

All of these technology developments are part of the standard production processes at Allegheny Ludlum, as well as at many other specialty materials producers. They are used in combination or alone to achieve unique combinations of quality, properties and cost efficiency. But, there is more to come.

Technology continues to be a vital force at Allegheny Ludlum Corporation. After all, we cannot forget what "got us here." Our long-standing commitment to research, development and technical service was supported by an investment of $31 million in 1987. This represented 3.6 percent of sales, far above industry levels. More than 400 people — over 20 percent of the salaried workforce are employed in these technical areas. A deep intuitive understanding of the role that technology plays in our business pervades the ranks of our company from top to bottom. We believe with a passion that only through technology can we survive and prosper. We believe that technology is an investment, not a cost. But it requires financial strength to wait for the "pay off."

We at Allegheny Ludlum know that technology development is an evolutionary process of development, implementation and improvement over long periods of time. We know we must build on the technologies we install; we must refine them;

and we must improve them. We intend to carry this process into the future; creating new processes by which we can create new materials with better performance. For example, in the process development area, we have been working to develop a process to directly cast thin stainless steel strip from liquid metal. This process will eliminate a number of costly steps in the manufacturing process and, even more importantly, enable the production of new alloys with unique metallurgical properties and characteristics.

Equally significant, we are developing new applications for specialty materials, which will provide an opportunity for future market growth. As one example, the government recently passed a fuel efficient energy law for all home heating furnaces that becomes effective in 1990. Under the law, furnaces must exceed an 80 percent efficiency level, a level that can only be attained with a stainless steel heat exchanger. Allegheny Ludlum has patented the material of choice for that application. Similar developments are occurring in the automotive market where in 1989 and 1990, three new auto models will go to stainless steel bumpers encased in surlyn plastic. This is in addition to the 60-70 pounds of stainless steel now contained in the typical auto — up from less than five pounds in 1972. As consumers seek greater quality and durability in their purchases, we believe that the applications for specialty materials will proliferate.

Obviously, I have painted an optimistic picture for the future. Our markets are growing, and our commitment to technological development and productivity remains strong. Still, I would be remiss in discussing the future of my company — and the specialty steel industry as a whole — were I not to mention the one issue that still concerns us — namely the fact that we still must compete with foreign companies which do not have to earn a profit to survive and, therefore, are not subject to the disciplines of the market place. We should not let current prosperity lull us into thinking that this world has changed.

The specialty steel industry has been forced to compete against companies throughout the world which have not had to earn a profit for long periods of time (Attachment 3), and whose objective has been to capture our U.S. markets as well as our export markets. These are not companies which are more productive, more efficient, more technologically advanced. They are companies which have the financial strength of their government behind them.

The specialty steel industry has over the past twenty years proven injury under the antidumping and countervailing duty laws; in section 201 escape clause cases; and under section 301. Unfortunately, the laws as they are presently written and administered impose no penalty for past violations. Penalties imposed are all prospective. The laws do not compensate the victim — the specialty steel industry — for lost profits, lost employment, lost opportunities to grow and, the focus of these hearings, lost investment in technology which could improve our competitive position even further. The twenty-year battle we have waged illustrates clearly that even efficient, productive, technologically-advanced firms can be driven from the marketplace by less efficient, less technologically-advanced companies — if they have the financial power of their national governments behind them.

I believe that it is important to recognize the answers to the questions posed by this panel: "Can U.S. producers of specialty steel provide the future products and processes its customers will need in the years ahead?" And, "Is the specialty steel industry's research capability keeping up with foreign competition?" Make no mistake, the answers to your important questions will be affected and determined by the trade policies implemented in future years.

As you know Mr. Chairman, I have participated in the international trade debate in this country for the entire fifteen-year period I have been Chairman or President of Allegheny Ludlum. In that debate, I have represented an industry which in the President's own words has been victimized by "persistent over-production, some of it subsidized, as well as trade barriers and distortive practices used by our trading partners to protect their domestic industries and to stimulate exports." This aspect of our international trade must be dealt with by our nation — and specifically our government — in the coming years, otherwise even the most competitive among us may be placed in jeopardy.

In sum, while I have this morning dealt with the internal reasons for our success at Allegheny Ludlum, I close by underscoring that these critical, external factors — over which we have no control — continue as critical issues. If not dealt with, they can turn our success into failure. If there is a proper role for the U.S. Government in the future of the U.S. steel industry — and specifically, the specialty steel industry — it is to ensure that these external factors do not undermine our successes. We do not ask for handouts; we do not want subsidies. We have amply demonstrated that we can generate the capital necessary to invest in our future on our own. We do ask, however, that our government take an active role in ensuring that our markets are not depressed by the products of foreign producers sold at prices made possible only because their governments fund their losses and provide their capital. If the U.S. Government does nothing about these practices, the technological and productivity gains in specialty steel over the past two decades will have been for naught.

Thank you Mr. Chairman.

Attachment 1

U.S. MARKET GROWTH FOR STAINLESS STEEL SHEET AND STRIP
(Allegheny Ludlum's Largest Product Line)

Avg. Annual Period	Avg. Annual Tons*	Growth Index
1961 - 65	403,318	1.00
1966 - 70	538,186	1.32
1971 - 75	646,426	1.59
1976 - 80	778,474	1.92
1981 - 85	829,503	2.04
1986	921,355	2.27
1987	1,013,955	2.51
1988 **	1,183,000	2.93

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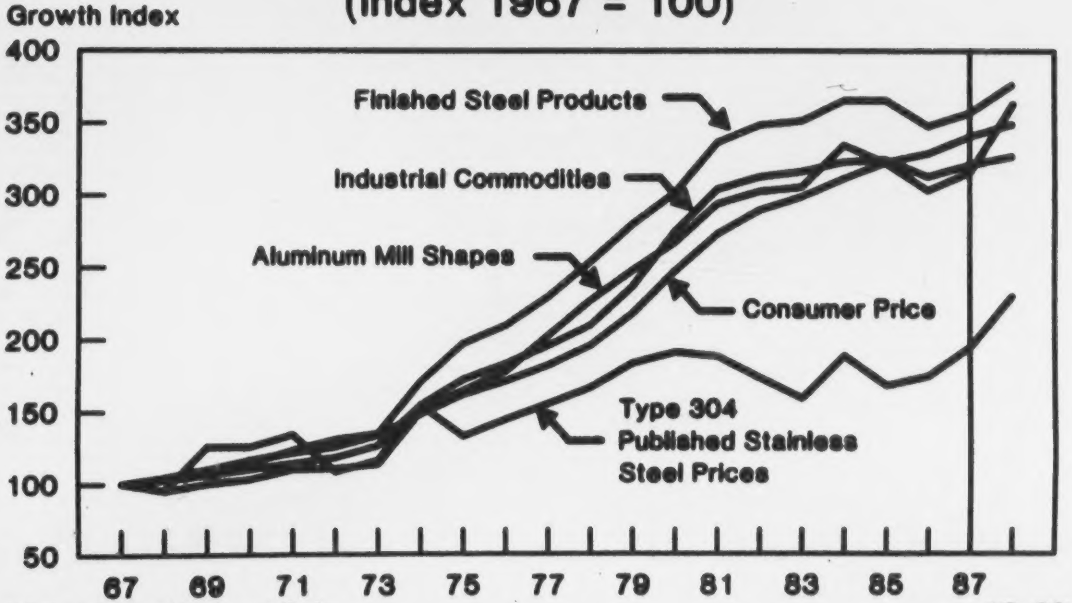
* H.R. & C.R. Sheet and Strip

** 1Q-88 Annualized

Attachment 2

Allegheny Ludlum
CORPORATION

PRICE COMPARISON OF COMPETITIVE PRODUCTS
(Index 1967 = 100)



*H.R. & C.R. Sheet and Strip

American Metal Market — 5/25/88

STEEL

Usinor Sacilor eyes profit after 13 years in red

By LISA BANNON

PARIS (FNS)—After 13 consecutive years of losses as both separate and combined producers, Usinor Sacilor, the French state-owned steel group, said it expects to report a net profit of 2 billion francs ($350 million) for the first half of 1988.

Separately, the company said it has formed a collaborative agreement with Cockerill Sambre of Belgium to create a common marketing firm to sell the two companies' merchant mill products. The two producers are also studying the possibility of combining their respective rolling mill divisions.

Usinor Sacilor, which has reported annual losses since 1975, said it cut its net loss in 1987 to 5.5 billion francs ($960 million) compared with a net loss of 12.5 billion francs ($2.2 billion) in 1986. Sales for the year declined by 9.3 percent to 67.1 billion francs ($11.7 billion), the company said.

The net loss for 1987 includes an extraordinary loss of 4.5 billion francs ($780 million), which includes costs incurred through the company's massive restructuring. Without the extraordinary loss, the company's consolidated loss for the year totaled 1 billion francs ($170 million) compared with a loss of 3.5 billion francs ($610 million) in 1986.

Meanwhile, the company said it was creating a marketing firm with Cockerill Sambre to be called Lamines Marchands Europeen (LEM) which will market the merchant mill production of the Metalescaut division and Cockerill Sambre's division, representing 500,000 tons of capacity.

Arbed of Luxembourg may also join the alliance, the company said, which would add 200,000 tons of capacity from a rolling mill in Schifflange.

Usinor Sacilor will be the majority shareholder in the new company and will retain majority control even if Arbed joins, a Usinor spokesman said.

The marketing network will include the sales forces of Metalescaut, Cockerill Sambre's Steelinter and, if Arbed joins the group, Trade Arbed.

Metalescaut employs 460 and produces 300,000 tons at its electric steel mill and merchant mill in Trith Saint Leger, France. Its sales in 1988 are expected to total 650 million francs ($114 million).

Ruau employs 330 and produces 200,000 tons of rolled steel at its mill in Charlerol, Belgium. Sales in 1988 should total 380 million francs ($66.6 million). Arbed's mill in Luxembourg produces another 200,000 tons of laminated merchant steel.

Cockerill Sambre and Usinor Sacilor also are studying the possibility of forming a Franco-Belgian holding company grouping the two producers' rolling divisions, which could reach the size of the largest Japanese counterpart.

The agreement would allow for mutual research and development, production and sales. It includes Usinor Sacilor's Chavanne Ketin division, which includes three rolling mills, and its Thionville iron mill division. Together the two could produce a complete range of cylinders in any dimension, as well as forged, molded or centrifuged types. Chavanne Ketin had sales of 400 million francs ($70.1 million) last year and employes 553.

Cockerill also produces forged cylinders in all dimensions and has four mills in Belgium. The company had sales of 1.4 billion Belgian francs ($30 million) last year and employs 395.

Lastly, Usinor Sacilor said it plans to take over production of the grain-oriented sheet that Cockerill Sambre had planned to stop producing. The sheet division had sales of 200 million francs ($35 million) last year.

The company said it expects to report a six-month profit as a result of restructuring since 1977 and a currently strong demand for steel in Europe and worldwide.

The company warned, however, that the extremely favorable market conditions of the first half of the year should not lead the industry to underestimate the problem of overcapacity. The company is now examining the market outlook for 1989 but expects the rest of this year to continue favorably.

The positive results anticipated for the first half of this year include improvement in all branches. Sollac and Ugine, its flat-roll and stainless steel divisions, continue to improve compared with last year.

Unimetal, the long products division, and Ascometal, the specialty steel unit, are expected to break even this year after fairly heavy losses in 1986 and 1987. The company's other branches, including metallurgy, processing and trading, should see a considerable improvement compared with the first half of last year, Usinor Sacilor said.

The firm's massive restructuring included the layoff of an average of 13,000 to 15,000 employees per year since 1977, leaving work force levels at 57,622 at the end of 1987 compared with 142,760 in 1977. The producer also closed 37 percent of its hot-strip mill capacity over the past 10 years and now has capacity of 6.4 million metric tons.

Attachment 3

Allegheny Ludlum Corporation

executive profile

RICHARD P. SIMMONS

Richard P. Simmons is Chairman and Chief Executive Officer of Allegheny Ludlum Corporation.

Allegheny Ludlum Corporation is one of America's leading specialty materials companies producing stainless steels, silicon electrical steels, electronic alloys, and high temperature alloys in a wide range of grades and specifications at plants in Pennsylvania, Indiana, Connecticut, Oklahoma, New York, and Illinois.

Mr. Simmons served as Vice President of Steel Manufacturing, Vice President and General Manager of the Flat Rolled Products Division; Executive Vice President of Allegheny Ludlum Steel before being named President of Allegheny Ludlum Steel in October 1972. Mr. Simmons was President of the Metals Group as well as a member of the Executive Office of Allegheny Ludlum Industries and a Director of Allegheny Ludlum Industries (now Allegheny International) prior to the purchase of Allegheny Ludlum Steel Corporation by Mr. Simmons, a number of other key management employees and other private investors in December 1980. In May 1987, Allegheny Ludlum Corporation once again became a public corporation traded on the New York Stock Exchange.

Mr. Simmons is also a director of PNC Financial Corporation and Pittsburgh National Bank, a director of USAir Group, Inc., as well as a director of Allegheny Ludlum Corporation.

Born in Bridgeport, Connecticut, and graduated from Massachusetts Institute of Technology in 1953, Mr. Simmons began his career with Allegheny Ludlum Steel Corporation in 1953; held management positions with Republic Steel Corporation and Latrobe Steel and returned to Allegheny Ludlum in 1968.

He is a member of the American Institute of Mining, Metallurgical and Petroleum Engineers; and is a fellow and a Distinguished Life Member of the American Society for Metals. In 1986, Mr. Simmons received the William Metcalf Award of the Engineering Society of Western Pa. for outstanding engineering achievement.

He is also a member of the Board of Trustees of Sewickley Valley Hospital and of the Executive Committee of Allegheny Conference on Community Development; a director of the United Way; a trustee of Penn's Southwest Association; a member of the Development Committee, Massachusetts Institute of Technology; a trustee of the University of Pittsburgh; director of the Pittsburgh High Technology Council; chairman of the Associates Program of the Katz Graduate School of Business at the University of Pittsburgh; director of the Pennsylvania Economy League; a director of Pennsylvanians for Effective Government; and a trustee of the Carnegie.

He has become nationally recognized as an advocate of "fair trade" in international trade and is Chairman of the Executive Committee of the Specialty Steel Industry of the United States. He was also Chairman of the Committee from 1975 to 1980 and 1985-1988.

Mr. **Walgren**. Thank you both for that testimony, and I find it striking and compelling, and I wish so much different had happened over these years, particularly with respect to imports that have plagued our area—through the steel industry, our area of Pennsylvania very directly, and I can only hope that this trade bill that the President will now sign has the seeds in it that, coupled with an active executive in the future, will limit the damage—the kind of damage that you have struggled with in your particular companies and that our region has struggled with as an overall economic effect, and I wish there were more we could do about that, and there will be, but I guess that's an issue that will ultimately be wrestled with through the years by future Congresses as well.

But let me turn to the more specific area of the research and the development. Admittedly, if we had a tremendously flourishing industry, we certainly would have lots of resources to deal with and certainly would have the ability to do the capital investment that might be required, I guess from no matter where it might come, but, nonetheless, the industry could certainly be modern.

But what about the research and development? What has been the—as you look back on the last 20 years, do you feel that we have been restricted and limited in what you as a company and what your companies as an industry have been able to allocate to research and development?

Mr. **Graham**. I guess there is a balancing act in any company, Congressman Walgren, that runs to distribution of elements of cost, and R&D, as desirable and praiseworthy as it might be, in general, has to bear some relationship to the overall state of the business.

We had in our own company a vastly greater population engaged in research and development in the fifties and the sixties. Of course, we were a much larger company then. What became increasingly apparent was that it is money ill spent in research and development if the payoff can only come about when new technology is reduced to practice on a production scale.

We devise things in research and development, and we do not bat a thousand. It is like drilling for oil. I mean there are dry holes. That judgment most commonly can only be made when a production scale installation is built and the process is tested. In a stagnant or declining market, there is no opportunity to build production scale, or minimum opportunity, to build these production scale installations. It is not really feasible to stockpile technology; it is kind of a perishable commodity; time passes by. So the activity level has to be cut back in recognition of the business realities and the opportunity to invest the capital in a full-scale production installation.

I think that is a situation that is perhaps peculiar to steel. I am sure there are many industries where developments can move rather promptly and perhaps at much lower capital risk from research department auspices to the production line. That is not the case in our business. We have to have the opportunity, particularly at the front end of our business, the primary steel-making activities; we have to have the opportunity to reduce technology to practice to demonstrate that, in fact, we have a success on our hands.

Now because of the nature of our marketplace and our decline in share there, we have been denied that opportunity for a substantial period of time. That has had its inevitable effect in down-sizing our investment in research. If our marketplace can be turned around—and there are some signs and portents that that is not an unrealistic possibility—there will be a resurgence in research and development activity in anticipation of the fact that there is the realistic opportunity to reduce that thing to practice and demonstration on a production scale that we have got something worthwhile.

Mr. **Walgren.** Mr. Simmons.

Mr. **Simmons.** It's interesting to draw a contrast between Mr. Graham's accurate description of his industry and the luxury that we have enjoyed in our industry, and the luxury for us has been growth. As I have already indicated in my testimony, the specialty steel industry, and particularly the flat rolled stainless industry, has tripled in total demand since 1960, as a result of which some of the disadvantages that Mr. Graham pointed out and difficulties in investing increasing amounts in R&D have not been present, to our benefit. So, as a result of the growth in our industry, we have been able to continue to fund substantial amounts of research and development.

I would like to distinguish between research and development which is focused at the technology of manufacturing specialty steel and the technology that is focused at making new products. We also enjoy the luxury, because of the very diverse nature of specialty materials, and we have more degrees of freedom in designing products that our customers and our markets desire, and so for a company like Allegheny Ludlum or the specialty steel industry in general, we have the ability, because our markets have grown, to invest in technologies to produce better products through new technologies of manufacture, and, at the same time, we have had the luxury of developing products that did not exist before through new product development, and so the specialty steel industry has enjoyed those two luxuries of both process development and product development.

One good example of that is, the Congress passed a law last year that requires gas home heating furnaces to have a minimum efficiency of 80 percent starting 1990 or '91. The specialty steel industry provides the mechanism by which that will be achieved. Each of the gas-efficient home heating furnaces after that time will have a stainless steel heat exchanger, and actually for the most efficient furnaces it will be a patented alloy patented by Allegheny Ludlum.

Mr. **Walgren.** You indicated, Mr. Simmons, these several breakthroughs or several specific developments that led not only to lower cost in several instances but dominantly to new products in the first two that you cited. If our research effort is down because of the—well, I guess there is a question. Would you anticipate similar kinds of developments in technology, in even basic science, that would provide similar kinds of steps forward in the future? and if the past is prologue at all, they were there in your industry, would they not be there then in Mr. Graham's side of the industry as well? and, if so, how are we positioned to bring or get to them, literally—I guess the question is, what led to those several that you cite, and are we in a position as an American industry to have the same opportunity to make the same kind of breakthrough advances in basic steel and also in the future steps forward in specialty steels?

Mr. SIMMONS. Let me answer the question in two ways. Mr. Graham has already made the point that within every company you allocate a certain portion of your resources to research and technology, like cutting up the pie. Obviously, there has to be a pie to cut up, and, as I pointed out in my testimony, all of this starts with profits, and then you begin to allocate those profits to certain investments, whether they be new facilities or research and technology or wherever else you may choose to allocate the additional resources that you may have available.

It is very clear to me that the kind of Government programs that provided opportunities for the specialty steel industry over the last 10 or 15 years, with the restraint program that was in effect from 1976 to '79, and now our ability to participate in the VRA program has provided us the opportunity then to have a bigger pie to cut up.

I am very confident if we have similar programs in the future—and Mr. Graham has already recommended and I support the extension of the VRA—that the technology investments in specialty steel will continue to go forward and will continue to develop the kinds of technologies in the future that we have already reported on in the past.

Mr. WALGREN. Can we distinguish between the technology investment versus the technology development? I gather at the core of each of those four steps that even develop new products that were not conceived prior to that was some kind of advance in science, and, as Mr. Graham said, he looks appreciatively at the university-industry center that you are working with at Northwestern. But it is my impression, although I don't know exactly, that the Federal dollar lies in most major research universities—funds essentially 90 percent of the research that is done at those universities, and so what I'm trying to get at here is, what is our role? Can you recommend a role for us? Obviously, I take it Mr. Graham would recommend strengthening the university-based role that the Federal Government may already have if you find that university support helpful.

Can we look at the specialty steel advances and say that there is something that can be added by Government other than making sure the industry is strong enough to both make an effort on its own, obviously, but be in a position to put in place technologies that are available?

Mr. SIMMONS. From our vantage point, it is a very, very sensitive area of what is the appropriate role of Government to play, for very obvious reasons. We certainly support the concept of broad, generic-based research that provides new knowledge and assists in major problems like the problem that Mr. Graham identified, the front end of the steel-making process in which ultimately perhaps there has to be a way of replacing that, and so we support the generic kind of assistance that is much more fundamental and basic in its nature and which has a very high risk factor, as has already been pointed out.

We get very nervous in the specialty steel industry when we see Government-supported industry- or company-specific projects that are focused at a very specific problem that may benefit one company to the disadvantage of another company. We get very concerned about the involvement in Government in areas where the Government is starting to pick winners and losers, perhaps to the disadvantage or advantage of some.

I have to, as an example, point out that my company, Allegheny Ludlum, has been working on strip casting for over ten years without any Government funds. We have invested something on the order of $10-15 million. We are probably as far along or further along than anyone in the United States and perhaps the world in the ability to convert liquid specialty steel to strip as thin 20 thousandths.

We then become troubled when we see the Government funding other research in this area, particularly if it involves specialty steel, when we view this as the role of individual companies, since I point out, a specialty steel industry market has been a growing market, so that we have not been faced with the similar type problem that we have already heard with regard to carbon steel, and I have to admit that we are tender on just what the appropriate role of the Government should be. But we do support broad, generic, basic research that is high risk, that probably no single company can fund on its own.

Mr. Walgren. Mr. Graham, would you like to comment?

Mr. Graham. I would just say that I would be remiss if I left the panel thinking that we are some kind of an orphan in the development of new technology. I mean we can cite triumphs in our own businesses, but I would be quick to acknowledge perhaps not enough, perhaps not fast enough.

One side electrogalvanized sheet, which has probably been the underpinning for the recent automotive warranties, is a peculiarly U.S.A. development, and we are now in the position of being able to license overseas competitors for that. The self-flux pellet, which is peculiarly useful to American producers; it enables us to use the taconite ores in Minnesota efficiently in our blast furnaces; these are all U.S. developments that have emerged, so that I don't think you should leave here with any impression that we have been inactive, or unsuccessful, and so on.

But, quantitatively, is that enough? Probably not. What is the remedy? I think we have to look to the marketplace, and I think that a businessman will always want to have R&D activity that is appropriate to the market opportunities that he foresees, and if the market opportunity isn't there R&D will have to suffer along with other aspects of the business. That is, I think, an inescapable fact of life.

We see some signs that we have had—we have enjoyed some stability in the marketplace. The VRA's have, in fact, made a strong contribution to that. I think from the standpoint of encouraging further technological development in the steel industry the most appropriate role for the Federal Government is to deal with that aspect of the market problem, which is bigger than any single company or our total industry, we simply can't touch it, and I think that research and development will, in fact, flourish if our market side is dealt with.

Mr. **Walgren**. We have to respond to a vote on the Floor. I apologize. I hope you can stay to give Mr. Ritter a chance to raise some thoughts with you, and it takes us ten minutes to go over and back; we would be in a position to resume in ten minutes, if you can stay with us.

[Recess.]

Mr. **Walgren**. Let me call us back to order, if I could. Mr. Ritter is on his way. But I wanted to ask both of you to discuss a little bit about where this Federal Steel Initiative fits in, assuming that we can get beyond the problem of benefiting one company as opposed to another company.

We obviously are imposing environmental problems on the industry, and there may be further environmental problems imposed. Is there potential through that mechanism to take some of the steps that would be like the four basic steps that the specialty steel industry has benefited from in these several years? How do you see the proposal that the AISI, as I understand it, is joining in suggesting, and what were your reservations about the previous proposals that have been made as we tried to start that program?

Mr. **Graham**. I'd say, first off, everybody should recognize that the proposal that we have forwarded to the DOE deals with what I characterized in my statement as a very high risk undertaking, and it's a massive undertaking, and the outline that we have started with is only the tip of the iceberg, and none of us should have any illusions about that, because I think frequently people are inclined to kind of schedule invention, and that is not a realistic way to look at these things. This is kind of seed money, and there will be many forks in the road along the way where important judgments will have to be made. In other words, is the progress such and are the prospects for success such that they are being validated at each step and therefore it warrants a further investment of funds, and so on and so on. I think that is a realistic way to look at this thing.

As unpleasant as it is for many people, frequently scientists start down these roads and we find that we have to change direction radically or we have to abandon and start over and so on. That is in the nature of the process, and I think people who sponsor that kind of activity need to have a seasoning on that thing.

Now what we are about with this proposition is very much in that area, and we should all be realistic about that. Having said that, we think it is appropriate, and we want to go forward with it.

Mr. **Walgren**. Any thoughts, Mr. Simmons?

Mr. **Simmons**. Only that I would stress again that I think that there is a role for Government to play in dealing with problems and challenges that are industry focused rather than company focused. You touched on it, I believe, with the changing environmental laws. Some of the proposals that are being considered or will become law have created very serious problems for the specialty steel industry, as well as the steel industry in general, and it would seem to me that there are areas here for work to be done that would benefit all companies with regard to how do we dispose of the hazardous waste now that the Government has defined certain products newly as hazardous.

For example, the bag house dust that we generate as part of our environmental attempts to keep the air clean have now been defined as hazardous since they all contain heavy elements such as lead, tin, zinc, and hexavalant chrome, yet, in the State of Pennsylvania, as you perhaps know, there is not a single hazardous disposal site, so that the laws passed by the Congress have put us in a position where we are required to remove from the air these dusts and we no longer have any place to dispose of them. We used to be able to store them on our own site; we can no longer do that under the law.

So that there would be an area of technology development that would benefit all companies, and the problem, in effect, has been created in part by the Congress itself in the passing of certain laws and the administration of those laws by the EPA. I think that this entire environmental area offers the possibility of some technology development that would benefit all companies and perhaps in which no single company can be expected to invest its own funds.

We have a similar type problem in the specialty steel industry with regard to the acid waste disposal problems since we generate acid waste with contained chromium, and it seems that there are regenerative processes that require a great deal of study. So the entire environmental area, I think, is one in which the Government can play an appropriate role.

With regard to the process of manufacturing specialty steel, we think that the role—for example, you touched on the four technologies that I mentioned in my testimony. There is a new technology breakthrough that is on the horizon. It is strip casting of specialty steels. But here it will permit the production of metal alloys that today cannot be produced, and, in fact, the National Aerospace Plane, which is referred to as NASP in which the Government is funding at $125 million in the development of materials for this plane, the material of choice at the moment is probably a material that will have to be produced by strip casting because it cannot be produced any other way.

In this area, Allegheny Ludlum has been working for ten years, but there are probably some basic areas of research in strip casting that could be funded by the Government that would benefit all companies, not just an Allegheny Ludlum or one of the other competitors in the field. But we have already been in this field, and we are producing materials today on a pilot basis that we believe ultimately will wind up in this National Aerospace Plane. That is the next blockbuster technology that we see in our field because it will not only reduce the costs of manufacture but, more importantly, will permit us to produce materials that cannot be produced today by any other way, and that is a technologically exciting thing for those of us that work in this field.

Mr. **Walgren**. Thank you.

The chair would recognize the gentleman from Pennsylvania, Mr. Ritter.

Mr. **Ritter**. I thank the chairman, and thank him for his leadership, and express my appreciation for his working on these issues over the years, and I think we are presently placed with a window of opportunity where, all of a sudden, there is some profitability in this industry, some very substantial profitability, and conceivably if we continue appropriate trade policies there will be profitability on into the future.

So all of a sudden, the science and technology, the research and development starts to become more important, it is not just survival time for steel companies, not—hopefully not in this era not just going to be hanging on by their fingernails trying to keep from falling off a 15-storey building.

I want to commend you, Mr. Simmons, for the excellent work that Allegheny Ludlum has done over ten years in strip casting, and I and the chairman were involved in a thin section casting proposal that I think USX and Bethlehem collaborated on. I think you were alluding to that to some extent, although indirectly, in your testimony.

But I think we need to focus on a few leapfrog technologies so that the production end, the process end, is not lost totally and completely to our foreign competition. I'd like some of your opinions on that.

At the meeting of the Executive Committee of the Steel Caucus the other day, it came to light that while we were making some significant strides in the process control because of our knowledge of computers and software and some of the American advantage there, that basically the machinery side, the production machinery side, like in so many other manufacturing industries, has gone overseas to a large extent, and I just wanted to get some feedback from you as to whether or not there is a chance for the U.S. to come back in the production machinery side and, if so, in what areas of the industry should we be putting our eggs, and then, to reiterate what the chairman was saying, is there an R&D partnership capability that would avail itself to the entire industry, and what would the role of the Government be?

Even in the semiconductor area, where you saw the foreign companies take the lead in production machinery, that industry has now gotten together to form this entity called Sematech, and they have entered into a partnership with the Government on the idea that semiconductors are so essential to the future of this country, they are the seed corn, so to speak, of the information age, but I think as you both have pointed out in your testimony, steel is still the single most important engineering, construction material that exists, and one should not look at its technology as having been completed, especially production process and manufacturing technology.

But with that in mind, maybe we can get some response from you.

Mr. **Graham**. With regard to the supplier base which was badly damaged by the recession in steel and fell to an almost nonexistent state—I don't think there is any question about that—I think to the extent we as an industry enjoy some reasonable kind of prosperity that thing will rebuild itself.

As of the moment, for instance, foreign manufacturers are looking for ways to manufacture this equipment in the U.S. In other words, the change in the currency has had that sort of effect on them. I mean this has become the low-cost place in the world to manufacture most things. That thing can't change overnight, because major rolling mills and major new casters and so on, when we had the 250 yen to the dollar, were more appropriately manufactured in Japan or in Europe. At 130 yen to the dollar, if everybody had their druthers, they would do it here right now, but you can't create that kind of infrastructure overnight. But I would say the economic incentives are now present for that to occur, and I think we will see more of it happen with regard to the supplier base.

Mr. **Ritter**. Is that foreign companies' developing manufacturing capability here? Do we have something left of that supplier base that can come back to life, or is it with respect to Germany and Austria and Japan, is it kind of—

Mr. **Graham**. Well, you know, the nature of the ownership gets to be confused and multinational in this thing, but clearly the economics of the manufacturing process argue now at this current exchange rate for that manufacturing activity to take place in this country. Whether under foreign ownership, domestic ownership, whatever, the economics argue for that, and people are struggling to find ways to make that happens.

With respect to your other comments, Congressman Ritter, and with all due respect, there is a great romance about breakthroughs and leapfrogs, and I would just observe that it is in the nature of our industry and has been for a long time that progress has not occurred in leapfrog fashion and it hasn't been characterized by breakthroughs, and I could go on at some length to try to rationalize that but I'll just assert that as a fact right now.

I personally am not optimistic about the breakthrough or the leapfrog type of thinking because I am afraid we could disillusion supporters and sponsors by tacitly accepting that notion that that is available out there and that all we have to do is fund it. I am personally very dubious about that.

Progress in our industry has been evolutionary; it has been characterized by that, which is not to say there hasn't been progress, but it has not been characterized by what I would call breakthroughs nor by leapfrogs. So I think we run the risk of disillusioning our supporters by suggesting that this is possible merely if funds were made available. I'm very skeptical about the prospects.

Mr. **Ritter**. Yes. I would almost tend to agree with you, because sometimes what appears to be a breakthrough is a very evolutionary process of small steps forward that, by the time you sum it all up, it is a breakthrough. The VCR is a classic example. It didn't go from an Ampex to today's VRC in one breakthrough year; it took 15 years. The high definition television the Japanese have just come up with, a compact disc, all of these things were highly evolutionary with continuous process improvements that led to product improvements and vice versa, and I think the ten years' experience of Mr. Simmons and Allegheny Ludlum on strip casting probably points in that direction.

I guess I was curious as to whether or not, you know, since the semiconductor industry sees the importance of the equipment manufacture/production process as being critical to the eventual product, are there any parallels in steel where production process could serve as a kind of common ground where the industry would work together and pool resources so as to counter some of the tremendous machinery—production machinery advances that the foreign competition have made?

Mr. SIMMONS. Let me add a point to what Tom has said. I would draw a distinction between the current economic incentive to manufacture equipment in the United States with the technology that is used in that particular kind of equipment. I am not as optimistic that we are going to see the rebirth in the United States of the equipment industry that supplies the metals industry, and it is not just the steel industry but it is aluminum and copper and brass.

Mr. RITTER. I think you can extrapolate that to the materials industry, and you can add plastic materials to that as well.

Mr. SIMMONS. What we see is, yes, the decline of the value of the dollar relative to other currencies creates the economic impetus to move manufacturing back here, but most of the technology that we see at the moment is coming from overseas, and it is regrettable to have to say that, but I think that we have lost the basic equipment infrastructure in the United States, and if it is rebuilt—and if it is rebuilt, I think it is going to be rebuilt with foreign ownership or with foreign technology transferred back to the United States, and that may be the appropriate way for it to happen.

I find it embarrassing to admit that if we were to go out and buy another continuous caster today, it would probably most likely be a foreign technology supplied by a foreign company even if it were manufactured in the United States, and that is regrettable.

Allegheny Ludlum is very proud of the fact that when we send purchase orders out for anything from pencils to paper clips to rolling mills, stamped on it is "Must be made in the United States," and this has been true at our company for 15 years, unless we give specific approval. We have been forced in two cases to give specific approval for important pieces of equipment because the technology and the technology infrastructure no longer exists.

I am not as optimistic that I am going to see this re-occur in the United States, but to Tom Graham's earlier point, part of the problem—there are two parts to the problem. One is, if the industry isn't growing in the United States, there is no need for an equipment infrastructure to supply it. So if there is not a growing demand for steel, we are not building new steel plants and therefore there is no need for the equipment, and then you have the incremental disappearance of the technology.

The second aspect of it is that if—along with the technology is the lack of the financing ability so that when we go to buy this massive piece of equipment the foreign company says, "Not only do we have pretty good technology but we'll finance that for you over the long term at very attractive interest rates." Then the American equipment company is at a disadvantage that is insurmountable, and I personally believe that in today's world that is as much a problem. I would have to say to you that if we went out to buy a continuous caster today, the caster would be financed by a foreign company.

The final point I would make is that I separate out the leapfrog technology I described in thin casting and agree with what Tom Graham has said. We have a saying at Allegheny Ludlum: "Success is three yards and a cloud of dust." Rarely do we have the opportunity to throw the 80-yard bomb. Once in a while we do, and in those four technologies I described we did, and the U.S. industry as a result has been highly competitive throughout the world and, really, world leaders and still are world leaders.

We have another opportunity, I think, in the coming decade or so in the strip casting area, but I couldn't agree more with what Tom has said. Most of the progress we make is by improving incrementally over long periods of time the technologies that we have installed.

Mr. WALGREN. Well, this is an inefficient process that we have here, and I apologize for it, and we would like to continue with you, but we appreciate your time and we appreciate your perspectives and appreciate your being a resource and participating in our discussions. Thank you both very much.

Let me call the next panel: Donald Barnett, president of Economic Associates; Christopher Plummer, the director of U.S. and World Steel Service; and I want to ask to join that panel, because of some of the time factors people are dealing with, Professor Richard Fruehan from the Center for Iron and Steel Research and Carnegie Mellon.

If you folks would come forward, we appreciate it.

Well, welcome to our process, and why don't we start in the order in which I introduced you to the record. Your written statements will be made part of the record without more, and you can feel free to focus on parts of them or highlight points that you would like to emphasize, and time is always a problem in these hearings, and so let's shoot for something less than ten minutes. I don't mean to cut people off, but, on the other hand, other witnesses will have problems with their time if we don't use some discipline on ourselves, and I'll certainly try to join in that discipline myself.

So let's start with Mr. Barnett and go through the panel.

STATEMENTS OF DONALD F. BARNETT, PRESIDENT, ECONOMIC ASSOCIATES, INC., McLEAN, VIRGINIA; CHRISTOPHER PLUMMER, DIRECTOR, U.S. AND WORLD STEEL SERVICE, WEFA, INC., BALA CYNWYD, PENNSYLVANIA; AND RICHARD FRUEHAN, CENTER FOR IRON AND STEELMAKING RESEARCH, CARNEGIE MELLON UNIVERSITY, PITTSBURGH, PENNSYLVANIA

Mr. BARNETT. I'm Don Barnett, Mr. Chairman. It's a pleasure to address you today. I left my written remarks over there. My verbal, as is my practice, will be extemporaneous.

As you know and as the previous speakers have said, the industries have come through a rough period, a very rough period, but circumstances, particularly exchange rates, have changed, which have dramatically improved market prospects for the industry, and the industry has during the last five years made dramatic cost reductions, efficiency improvements, capacity eliminations, which unfortunately have been very, very painful both to the employees and to the companies themselves. We have about a five-year window of opportunity to permanently change the nature of the industry.

Now because of some of what the previous speakers have said, I have chosen at this point to address some items which they have not said. We in this industry are dramatically changing the nature of the industry itself. There are changes taking place in the markets for our products because their consuming industries for steel are also changing; they are diversifying; they are improving their quality requirements; they are becoming more demanding terms of steel. I put it this way: They want tailor-made steel products, they don't want off-the-rack materials any more. This is forcing our steel producers to be ever more specific in their quality, product, applications, which are, in turn, forcing increased capital expenditures on those producers. At the same time, our producers need to cut their costs and have done a dramatic job over the last five years.

But hardship brings change. We are now seeing a change in exchange rates which means better market prospects, increased profitability, and so on, but our increased prospects may mean hardship in other countries which, too, have steel industries, and that hardship will force them to make changes.

Now in my business, I deal with steel producers all over the world. All of them are addressing the same issues in slightly different ways: cutting costs, improving quality, changing technology. We have to deal with changes both in product quality, product type, and in the processes. The major process changes anticipated in the industry are simplified coal finishing producing better products, superior coating technologies, simplified rolling technologies, which is partly being introduced with thin slab, with thin strip casting, and of course we have to change the basic primary steelmaking process, the coke oven or blast furnace is going to have to be replaced.

Now we can't put any time and say this is going to happen in x period of years, but we know those changes are coming. Other producers elsewhere are addressing the same changes. The Japanese, for example, right now are starting to install the first versions of direct steel-making on a preliminary basis to see how it turns out. We will have to make those changes.

The industry doesn't have large pools of capital to make those changes, but they have to make them. In fact, one of the concerns I have about the industry is, if you ask them their capital budget plans over the next number of years, normally they will talk in the range of making capital expenditures equivalent to their depreciation clause, which is a good financial practice but isn't necessarily one that keeps you up with your competition. But it is the nature of the industry to make incremental changes, as was discussed, certainly that is the most important change that has taken place.

There are a number of major technological breakthroughs appearing here and there on the horizon—thin strip casting, thin slab casting, improved continuous coal finishing, direct steel making—which, while they are not going to be implemented immediately, do force the pace of change. The technological changes implemented are going to be driven largely by the market and by the economic circumstances.

The inventions that we come up with, the innovations we apply from those inventions, are going to be driven by the market. The market says we need certain technological changes to come forward and in a very short order. The U.S. industry is not making major expenditures in improving coke ovens and blast furnaces, so something has to be done with the primary end of steel making and perhaps in a very short space of time. The industry has this opportunity to make these changes; the question is, does it have the funds? does it have the direction?

Now the industry in the U.S. really is two different industries; there is the large integrated producers, and there is the mini-mills, and since that was not addressed by the two previous speakers I think it is worth pointing out that we have another segment of the industry which has grown from, say, 2 percent of the shipments to over 20 percent in about 20 years, and that is the mini-mills. Those mini-mills have captured the small bar business, the rod business, the light shapes business, and now are making efforts to get into the flat rolled product business.

The first plants being built are going into flat products, and while we don't anticipate a lot of those plants being built, they will have an effect on the industry, and that segment of the industry relies on scrap, simplified process technology, which it usually gets from other people who develop the technology, but it applies it rapidly; it applies it with low capital costs. That segment of the industry has put pressure on the integrated producers and has put pressure on foreign suppliers as well. That whole segment will probably continue to expand but at a modest pace because it is available scrap and may well be taken up, and it is going to have difficulty capturing increasing shares of the market.

But that segment of the industry has also forced the large integrated producers to disintegrate their operations, spinning off plants, making them, some of them, nonunion, selling them back to the workers, reducing the scale of their operations in many of those facilities, and overall cutting their costs, becoming more competitive. It has become a leaven in the lump which is dramatically changing the nature of the industry.

So while the change of technology may be evolutionary, the pace of market development is revolutionary. It is most exciting times in our business for the kind of things I do, which is strategic corporate facility planning the world over, because the pace and the rapidity with which they wish to put in technology is extremely rapid. The markets are changing for them, the opportunities are there, the technologies are just out of reach but hopefully soon will be in place for them to make the major changes they wish. The question is, can our industry keep up with the changes taking place?

We do see major developments, and the industry has done a tremendous job in improving product quality and processes and cost reductions, but the question arises, are they addressing the priorities, or is each company doing its own thing, heading off in different directions? Is there some way we can coordinate the efforts? because, as Mr. Graham pointed out, a lot of the efforts to improve technology don't work out. Is there any way we can share information to improve the process of information exchange so that companies don't go down blind alleys, so that they can develop those technologies most in need by the market rather than those technologies which offer the greatest intellectual challenge? Those issues have to be addressed, and I would like to have the opportunity to discuss that further.

Thank you very much.

[The prepared statement of Mr. Barnett follows:]

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Testimony Before

Subcommittee on Science, Research and Technology,

Committee on Science, Space and Technology,

U.S. House of Representatives

on

The Prospects for the Steel Industry

by

D. F. Barnett Ph.D

August 4, 1988

The American Steel Industry: Market and Process Changes.

D. F. Barnett Ph.D

Executive Summary

Background

The American Steel Industry has been through a prolonged period of extreme difficulty, with major capacity reductions, huge financial losses, plant and facility closures, enormous layoffs, Chapter 7 and Chapter 11 filings, and so on. These conditions had their anticedents in a polital/economic environment in the 1950s and 1960s which spawned government aided steel plants abroad, protection at home, oligopolistic corporate decision making which relied ultimately on government "help", slow development and implementation of new technology, and a reliance on high cost approaches to modernization. During this period the American Steel Industry steadily lost ground to a Japanese industry which by building upon and improving American pioneered technologies, rapidly outstripped the American Industry. By the late 1960s and 1970s the American Industry was steadily losing its home market to foreign suppliers, dispite repeated protectionist efforts. The 1970s also saw the peak in the world wide growth of steel intensive mechanistic technology, and the shift both by consumers and producers to a computer/electronic oriented technology which required less steel. From the mid 1970s to date there has been a much slower growth in steel demand worldwide, but steel producers were slow to recognize the changes underway and continued to add or retain capacity. The collapse of energy markets and the high interest rates of the early 1980s further contributed to the slowing in steel demand growth, adding significantly to world-wide excess steel capacity, and contributing to a profound structural change in world steel markets and the world steel industry.

An Industry in Turmoil

The early 1980s brought the world and American steel industries to their knees and hopefully to their senses. The five years from 1981 to 1986 were probably the most traumatic in the history of the American Steel industry, beginning with a market collapse, leading to enormous excess capacity, huge financial losses, layoffs, closures, and capacity retrenchments. These five years made it abundantly evident that profound structural changes were at work, changes in markets, technology and competitiveness, changes worldwide in scope and in effect.

This five year reign of terror has profoundly altered the nature of the US steel industry, eliminating about one third of steelmaking capacity, forcing consolidiations and rationalizations of facilities, dis-integrating the industry into more specialized plants without ownership of raw materials and with non-traditional ownership arrangements. As a result the US industry is currently judiciously installing demonstably superior short-payback new technologies, significantly improving productivity, dramatically cutting costs and improving product quality. It should be noted that foreign producers have also been reacting to the same market forces and restructuring their operations to cut costs, and improve quality.

Until recently one could argue with little qualification that there were in fact two distinct US steel industries: the large integrated firms relying on ore and coal, traditional large-scale technologies, and union work-forces; and the smaller "mini'mills" who relied on scrap based small-scale simplified technologies, and used non-union work-forces. This latter segment of the steel industry has, by virtue of low cost scrap, its simplified but rapidly improving technology, and entrepreneurial aggressiveness, steadily increased its share of the US market from zero in the early 1960s to over 20% today, essentially bycapturing bar and shape business from both imports and domestic integrated producers. This segment of the industry has always been in the forefront of applying new small scale technology, and is now poised to enter both heavy structurals and flat products, with mills under construction (by Nucor). These attempted inroads were made possible by new technologies in continuous casting (eg beam-blank casting for large shapes and thin-slab casting for flat products) which dramatically reduced the scale and construction cost of the rolling mills necessary for efficient low cost production.

The last few years however have made the distinction between mini-mills and integrated operations, somewhat less precise, as the latter has increasingly taken on the characteristics of the former. Major integrated firms have significantly down-scaled, spinning-off or "joint-venturing" plants which have become employee owned, entrepreneur-owned or even non-union operations of small scale. These spin-offs may rely on ore or may purchase semi-finished for further processing. At the same time some "minis" have grown in size and now exceed the independent integrateds. This "dis-integration" of the US steel industry and its restructuring is a response to market and competitive pressures.

The last 3 years, due in part to herculean restructuring efforts by the industry, the current VRAs, and especially recent downward revaluations of the US$, have dramatically improved the US steel market, enabling recapture of indirect imports (eg foreign auto-assembly plants in the US), and have significantly improved the competitiveness of the US industry. The result has been high levels of domestic steel shipments, high operating rates, significant improvements in profitability. This has encouraged renewed efforts to install new technologies, cut costs and improve quality. While business cycles are likely to re-occur, baring any fundamental recovery in the US $, the US steel industry is anticipating a period within which it can implement longer-term strategic plans to cut costs and improve product quality.

At the present time steel consumption is at or near its cyclical peak, with a downturn expected in the near future. Absent major exchange rate changes, steel consumption after the next downturn, on a trend basis, should be little different than current levels. For the longer-term however, a steady, but probably slow, decline in steel consumption should be anticipated due to the growth of steel substitutes. The real issue is imports vs domestic shipments. At current exchange rates the US industry is competitive with Japan and Europe, and absent VRAs should have little problem with fairly priced imports from these sources in the short-run. The immediate problem, with removal of VRAs, is likely to be steel from developing countries like Korea and Brazil. Over the longer-term Japan and Europe may restore their competitive potential.

Market Changes

The 1970s saw the beginnings, and the 1980s the full implementation, of a shift from predominately mechanistic to increasingly electronic means of production, especially in industrialized countries like the US, but also newly developing countries. These technical changes meant new types of products like VCRs, home computers, which captured an increasing share of the consumers budget, displacing steel intensive products. These changes altered the nature of steel-using products, like cars, which reduced steel requirements. These changes altered the nature of steel itself, such that lighter tougher more rust and wear resistant steels, meant less steel required to perform any given function. These changes altered how steel was produced, introducing smaller scale less mechanistic processes to carry out the same task.

The above changes are still in their infancy, with consequences for steel markets and steel production as yet unknown. On the market side, it is already evident that steel must fight a continuous war against substitute materials such as plastics and aluminum, where technological changes are extremely rapid. In order to remain competitive, the steel industry must dramatically improve the consistency of steel products produced, with better surfaces, improved forming and welding characteristics and so on, reducing rejects by consumers. Steel must also improve rust resistance with better coatings whether metallic or paint, and develop new composite materials for new applications.

The steel industry must shift from off-the-shelf production of standard chemistries and coatings to tailor-made products for individual application as customers become ever more specialized in their demands. This threatens to further fragment the industry as smaller scale purchases must be matched by smaller batch production, perhaps requiring an ever growing layer of steel fabricators between the current steel producer and the current customer. This further poses problems for who will carry out the research to facilitate these new market developments, the steel producer, the customer or someone else. Given the rapidity of market changes at work, it is doubtful that the mechanisms for the necessary market research of benefit to steel, exist, or will develop in the near term. This in itself favors competitive materials where research efforts have been more prolonged and pronounced, and/or increasing dependence on foreign steel product technologies being applied here.

Process Changes

Turning to prospective process changes, the industry as a result of its recent turmoil, has shifted its limited resources to selected crucial cost reducing and quality improving technologies, such as continuous casting, ladle metallurgy, continuous cold finishing and electro-galvanizing. The majority of US steel industry facilities are older however, although with significant operational improvements in many cases, and a large component of the equipment installations in recent years has involved rebuilding and redesigning older equipment to do new jobs. Most US builders of steel equipment have virtually ceased to exist.

The industry has put increased emphasis into making better grades and qualities of steel, superior coatings, and so on. The market has clearly indicated that with little improvements in steel volume likely, the greatest profit potential lies in higher valued and higher grade products. The age of the US industry steel industry finishing facilities indicates major refurbishing is essential, and to some degree this is underway, although no major new product technology is evident.

The major awaited technological change is thin slab casting, (and eventually thin strip casting). This process change, developed in Germany and Japan, but being implemented here first, by reducing primary rolling costs, will revolutionize how steel is produced, reducing scale requirements and construction costs. Thin slab casting is currently being installed at a new mini flat product mill in Indiana, by Nucor.

While the steel industry is modernizing its finishing operations and seems poised to implement revolutionary casting and rolling technology, the steel industry has for years relied on well established integrated technologies for making steel, using coke ovens, blast furnaces and basic oxygen furnaces, to convert ore to steel. While these integrated processes have had improvements, their construction costs are horrendous, so much so that no one anticipates building new coke batteries or blast furnaces. The industry needs and anticipates new primary steelmaking technology, defering major primary steelmaking changes as long as possible, and increasing reliance on electric furnaces and scrap. Unless a new iron ore conversion technology is forthcoming the steel industry will face major problems. The technological alternatives are direct reduced iron, plasma steelmaking, univeral steelmaking (smelting). It is not yet clear which technology will emerge and it will be at least ten years before one is significantly implemented. The steel industry may not be able to wait. In any case the research on these technologies has been very haphazard given the prospective magnitude of the problem.

Research and Development

The US steel industry has often been criticized for lack of research and innovation. It is true that the US steel industry has, in the past, not been a major leader in research expenditures. Financial and competitive pressures have derailed many research initiatives, and lack of direction from the steel industries customers have had a negative effect. The steel industry has also been slow to implement new technologies, due in part to financial constraints. However the mini-mill sector has been a rapid innovator of new technologies, and in the recent past the major integrated producers have been in the forefront in installing operating improvements and crucial technological improvements. While major technical changes can have a significant effect both on steel products and processes, it is the small incremental but continuous improvements which have the most pervasive impact. The American steel industry has been somewhat out of step in developing and implementing new capital intensive technologies, but in the forefront in installing operational improvements.

Over the next decade the American steel industry faces the necessity to rapidly develop new products and processes, to compete with substitute materials and foreign producers. The rapidity of the market and technical changes facing the industry are likely to exceed those in our memory. This during a period when the industry is likely to be increasingly fragmented, with smaller scale operations, each with specialized interests. In these circumstances it will be difficult for any one firm to make the necessary expenditures to fund serious product and process research and development. Efforts must be made to encourage or establish cooperative research and development efforts between firms, not on its current ad hoc basis, but on organized, priority driven, industry-wide basis.

7/31/88

Mr. WALGREN. Thank you, Mr. Barnett. We appreciate that, and we will turn then to Mr. Plummer.

Mr. PLUMMER. Thank you, Mr. Chairman, distinguished members of the panel, and the audience.

My name is Christopher Plummer. I am the director of the World Steel Forecasting and Consulting Services of the WEFA Group. The WEFA Group was formed in 1987 as the merger of two of the world's leading forecasting and consulting companies, Wharton and Chase Econometrics. We serve as the largest privately-held repository of economic data and as hand-picked adviser to over 4,000 companies and governments world-wide. Thank you for inviting me here to speak with you today.

My purpose today is to present our views on the outlook for, one, the economy and the steel industry, and, two, developments in domestic and world steel technology and their implications for the future competitive position of the domestic steel industry.

I have provided my presentation in written form prior to this meeting. Let me first start off with the summary highlights of my presentation. In sum, my company's views are as follows:

One, the ability to obtain and effectively employ the latest available technologies has become a prerequisite for the long-term survival of the steel industry.

Two, our research indicates that domestic steel demand is and will remain in the declining stage on a long-term trend basis. Steelmaking technologies should therefore, in our opinion, be viewed not as a major stimulus to demand but as a means of improving relative international competitiveness and moderating this long-term declining demand trend.

Third, steel-making technology is widely available in the international marketplace. Additionally, other countries have significant leads in the development of new technologies.

Based on these factors, we believe that if large-scale research in steel technologies are to be carried out in the United States, it, one, must focus on more radically advanced technologies not already being pursued by a large number of international players. For example, direct steel making rather than direct iron making for integrated mills and net or near net shape casting rather than slab casting for mini-mills.

Secondly, in order to get the best possible results with the widest sharing of financial risk, these research projects must be conducted on a joint basis involving steel makers, steel end-users, technological research institutions, and the Government.

Fourthly, perhaps the greater importance, however, is the cultivation of a business environment which promotes the capital formation required to employ the latest steel-making technologies. In short, this would involve such things as looser monetary policy, tighter fiscal policy aimed at lowering interest rates and stabilizing the dollars, and a tax system which encourages investment rather than consumption.

Fifthly and finally, the industry is not monolithic in nature. The two major sectors, integrated and mini-mills, have sharply different operating modes which require the development of different types of technologies. New mini-mill technologies will enable their users to make further inroads into integrated mill product lines such as sheet, plate, and structurals. These technologies will indirectly work at odds with new integrated base technologies. We anticipate that mini-mills' domestic market share will move from the present 22 percent to roughly 45 percent by the late 1990's.

I have divided my presentation into three major topics. The first, let me cover right now, is the U.S. outlook highlights. Our company's current long-term outlook is characterized by modest economic growth and a shift in focus from consumption to investment. That is, the distribution of output growth in the country will continue to move away from goods and service for domestic consumption toward goods and services for foreign consumption. By the mid- to late 1990's the U.S. will have, in our opinion, returned to a position of near balance in the real trade accounts.

The following points are highlights of our economic outlook for the next ten years.

Firstly, we anticipate average annual real GNP growth of 2.5 percent over the next ten years, slightly below the 2.65 percent average rate of advance seen over the 1967-87 period, and, more importantly, further below what we believe to be the steel demand maintenance range of 2.8 to 3.2 percent growth.

Secondly, a more positive development, we believe that the rate of inflation as measured by the GNP implicit price deflator is projected to average 4.4 percent per year through 1997, down from the average 6.1 percent increase over the 1967-87 period.

Thirdly, again a positive indicator, we feel that business fixed investment is expected to grow at 4.6 percent annual rate through 1997 versus the average 3.3 percent rate over the past 20 years. Purchases of capital equipment should outperform investment in commercial structures advancing at an annual rate of 5.2 percent.

Fourthly, a negative indicator for the economy and the steel industry, consumption spending is expected to slow to 2.2 percent annual growth through 1997 compared to the 3.2 percent average growth over the past 20-year period.

Additionally, since population growth will also decline from the fairly consistent 1 percent per year over the past 20 years to eight-tenths of a percent per year through 1997, we expect real per capita consumption, one often cited measure of economic well-being, to expand at a sluggish 1.4 percent per year compared to the 2.0 to 2.5 percent rate in recent history.

Lastly, since the late 1970's exchange rates have become a key driving force in both the steel industry and the economy in general. We believe that the Fed will continue to follow an interest rate policy which allows the dollar to decline in world exchange markets, thereby providing the needed stimulus for improvement in the U.S. trade position. As a result, we expect the dollar, on a multilateral trade weighted basis, to drop an average 2.1 percent over the next ten-year period with the steepest drops occurring in the 1987 to 1990 percent. In fact, by 1997 the dollar, in our opinion, will have fallen to its previous low of 91.1 registered in 1980; that is, with the index, 1987 equals 100.

Mr. **Walgren**. Let me stop you at that point and realize that you have some further comments on the steel industry's outlook and technology, but I am trying to manage several people's time, and

Mr. Ritter has a commitment he has to meet very shortly, and I wanted to give him an opportunity to raise some points.

Mr. PLUMMER. Sure.

Mr. RITTER. Thanks, Mr. Chairman, I appreciate that, and I have a meeting at 11:30, and I'm going to have to leave.

But in listening to the testimony of Mr. Barnett and Mr. Plummer on the subject of technology and the steel industry, from what I hear, you have put more substantial weight, particularly you, Mr. Plummer in your comments, on the necessity for survival to be at least competitive with the global technological—world class technological capability.

Yet that is quite different from what I thought I heard Tom Graham, president of U.S. Steel, say, and you talked about focus—Mr. Plummer, you talked about focusing on some significant areas that are above and beyond the norm and do constitute to some extent breakthrough, I guess, the direct casting into near final shapes and that kind of area, and also the steel making will probably come into that category. You have differed to some extent then with the president of the largest steel producer in America. What are your comments?

Mr. PLUMMER. Let me state this. In a sense, I may not have differed as widely as you think. Our company's opinion and my opinion is that unless the Government, the industries, the educational institutions, are prepared to make this significant step into more radically advanced technologies, it may in fact not be economically viable to pursue lower level technologies because of the fact, number one, of the financial risk, and, number two, because of the fact that other countries have such a substantial lead over the United States in terms of obtaining those technologies, and I think your committee has pointed out the developments in thin slab casting, the advances in direct iron making that a number of other companies such as CRA in Australia; Klockner, West Germany; Sumitomo, Kawasaki, in Japan have already been making.

So my point, I think, was to emphasize that these technologies are widely available on international marketplaces. From a financial standpoint, it would make more sense to obtain those from foreign sources, but if the United States wants to make a commitment—I think it would be an important development for the industry and for the country as a whole to do that—we must focus on more advanced technologies simply because of the fact that we are so far behind in terms of other countries, not because of the fact that we don't have the technology. The United States, in fact, over the last 20 years, has come up with a lot of the major developments in the steel industry. We simply have not had the capital or the incentive to invest capital in those projects, and therefore we have lagged.

Mr. RITTER. Mr. Barnett.

Mr. BARNETT. Well, I suppose my views come out that the industry will, in fact, put in technological changes that are at a somewhat more rapid pace than I read into Mr. Graham's remarks. Now I still maintain that changes will be evolutionary, but it is really a question of the rate of the change. I think most of the changes that we are going to see are going to be operational improvements; we have already observed that.

There are a few major changes which are coming, and I mentioned those. Continuous coal finishing is one which is already being installed. The thin slab or thin strip casting which will simplify the roll-in process, and we see that just on the horizon. It is a question of it is now being applied in slab casting form, but thin strip casting is next, and then there is the matter of direct steel making, which is probably the most needed technology out there, and what we observe is that most of the major producers in the U.S. have existing facilities—coke factories and blast furnaces—which they are modernizing—I'll put it that way—but that they are not making any major changes; they are not going out and building new blast furnaces or building new coke factories and so on partly for environmental reasons, mostly for capital cost reasons, but also because they anticipate technological changes, and I think what is going to happen is that you are going to see these start to be employed bit by bit in some of the existing producers, perhaps within five years. It may not be the most opportune, it may not be the best technology, but just as thin slab casting is perceived as the forerunner of thin strip casting, I think the need is going to pressure companies to make changes. The same need is pressuring companies in Japan to make those changes.

Mr. Ritter. Are these going to be American technologies, or are they going to be mostly imported?

Mr. Barnett. Well, the first thing you must understand is that there is another element at work here, and that is that the more favorable conditions of the U.S. market, whether it is the steel market or the market for automobiles, compared to Japan, is forcing Japanese investment here. It may very well be that joint ventures with Japanese or other foreign entities will create the increased incentive to add the new technology. So I think more and more that is going to take place, there is going to be more foreign investment here, and it is a question then, is it ours or is it theirs? The real issue is, are the benefits here?

Mr. Ritter. Dr. Fruehan, I know you haven't testified and I've got to leave, but as someone representing the research and development community, would you like to just comment on this query of mine?

Dr. Fruehan. Yes. I think it is good to point out that the proposal that is now being delivered to the Department of Energy on direct steel making, this will be a technology that will be American based to a great extent and that we will be making use of the raw materials that are in the United States, namely, ore, scrap, coal, in such a unique way that it would be unique to our particular set of circumstances.

I agree with the other two gentlemen here that if we are going to make incremental improvements—say, coal injection into a blast furnace to make a blast furnace more efficient—these kinds of technologies can be bought overseas, but in the more far reaching technologies—and in my case I am an expert in direct steel making—these will be developed—could be developed in the United States.

Mr. Ritter. But you had the president of a leading steel producer saying that this was not exactly where we should be focusing. I mean he didn't get excited about the fact.

Dr. **Fruehan**. I think Mr. Graham said that it is in the front end of the business where we need to have collaborative efforts for long-term developments and also where there is high risk involved, where a single company cannot take the risk of developing a new process alone by itself today, it should be done collaboratively and hopefully with Federal assistance.

Mr. **Ritter**. Just one last point, and then I am going to leave. The semiconductor industry, realizing that it had lost substantial ground, decided to collaborate with one another, got the Federal Government to back it up, saying that semiconductors were the seed corn of the information age and that you couldn't have a modern technological economy without it.

Well, I don't think you can have a modern engineering economy, a modern technological economy, without steel. It is such a pervasively important material, and technology never stops, it keeps going on, you keep bettering the quality and the capability. Why aren't we doing something like this with steel? Why don't we get our act together and take this most basic of engineering materials and try to create something more where the whole is greater than the sum of its parts?

Dr. **Fruehan**. May I comment?

Mr. **Ritter**. Yes.

Dr. **Fruehan**. I think what you are asking for is coming about through necessity. The companies themselves don't have the technical people available for major advancements or the financial resources, and there are several examples of collaborative work that is now going on in the industry in the right direction. The AISI direct steel making is one. The Steelmaking Center at Carnegie Mellon where there are 20 members, including all of the companies that gave testimony here today, where they are contributing towards long-term basic research; a similar type center in Colorado; the one at Northwestern; so the engineering centers, for example, at the LeHigh on steel structures. So there is more and more of this collaborative effort going on.

But one of the things that strikes me with this kind of collaborative effort and other new materials, not other new types of materials, is that it is being done primarily by the industry funding. In my testimony I will state that industry funding from my center is well over $600,000 a year. Federal funding is $50,000, and yet we know that university research is 90 percent Federally funded. Here is a case where it is 90 percent industrially funded. The steel industry is doing its share in the long-term research right now.

Mr. **Ritter**. Well, I am glad to hear that. I am just concerned when I see some of these other materials biting off such vast extensive partnerships with the Federal Government, getting the Federal Government to kick in essentially a substantial portion of it. Maybe that is not in the cards for steel, but they have done in on the West Coast in a very important industry, and one would suspect that the potential exists for steel, it being so important.

Thanks, Mr. Chairman.

Mr. **Walgren**. Thank you very much. We appreciate your interest and your help in this area.

Let me give you—and trying to keep us on time here. If you could take three minutes, Mr. Plummer, and finish your testimony, and then we could get to Dr. Fruehan and be on schedule.

Mr. Plummer.

Don, thank you.

Mr. PLUMMER. Let me try to excerpt some of the last points that I was intending to make here. As far as our outlook for the steel industry, we view that economic consumption will decline at an average rate of nearly 1 percent per annum over the next ten years. Domestic crude steel production will decline more rapidly due to increased semi-finished imports and efficiency enhancing technological advances in steel making.

The steel market, in our opinion, will experience intensified competition from aluminum, plastics, ceramics, composites, and other advances materials. The most intensely contested market in the 1990's is likely to be the automotive sector wherein products will make major inroads into the 1990's, plastic products.

End users, particularly in the transportation and construction sectors—and I think this is something that has been highlighted by previous speakers—will continue to demand increasing quality and greater strength to weight ratios. This will tend to continue to both be a catalyst for substitution and as a dampening factor for steel demand, and I might point out that this is one area wherein technology could be a major factor in dampening these competitive inroads by other products.

Let me briefly conclude my remarks by saying—let me comment on two areas. First, while a new era in steel-making technology is clearly on the horizon, a new era of increased steel demand is not. From a long-term perspective, steel demand in the United States remains in the declining pattern that characterizes the fourth stage of classic product life cycle theory. Steel intensity—that is, the amount of steel in the United States required to support each additional unit of real GNP growth—will continue on a downward trend into the future.

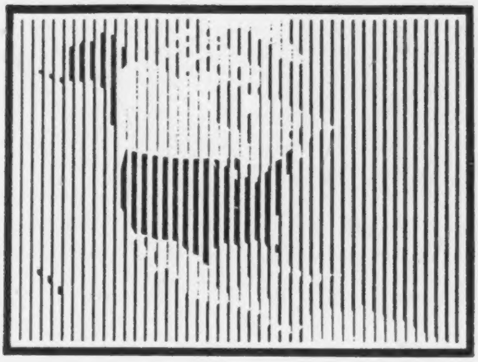
In recent years, we have witnessed the prevalence of an economic environment which places a premium on rapid corporate returns. This is largely the result of the inflation which took place in the 1970's. As a consequence, in steel and other manufacturing sectors managers skilled in finance have been favored over those skilled in engineering. Short-term research and development projects have been favored over longer-term research which often produces major technological breakthroughs.

Finally, ~~let me~~ sum up by saying that in our opinion steel makers who cannot afford or who cannot effectively employ the new advanced steel-making technologies will find themselves boxed into a very limited and increasingly unprofitable corner of the commodity grade steel market.

Ladies and gentlemen, that is my comments. I would be happy to expound upon or clarify any of those comments that I have made. Thank you.

[The prepared statement of Mr. Plummer follows:]

August 4, 1988



Statement By

Christopher Plummer
Director, U.S. & World Steel Service
The WEFA Group
Wharton Econometric Forecasting Associates

Congress of the United States
House Committee on Science,
Research, and Technology

THE WEFA GROUP

WHARTON ECONOMETRIC FORECASTING ASSOCIATES

My name is Christopher Plummer. I am the Director of World Steel Forecasting and Consulting Services for The WEFA Group, Wharton Econometric Forecasting Associates. Thank you for inviting me to speak with you.

My purpose today is to present our views on the outlook for: (1) The economy and the steel industry; and (2) Developments in domestic and world steel technology and their implications for the future competitive position of the domestic steel industry.

SUMMARY HIGHLIGHTS

In sum our views are as follows:

(1) The ability to obtain and effectively employ the latest available technologies has become a prerequisite for long-term survival in the steel industry.

(2) Our research indicates that domestic steel demand is, and will remain, in the declining stage on a long-term trend basis. Steelmaking technologies should therefore be viewed not as a major stimulus to demand, but as a means of improving relative competitiveness and moderating the trend of long-term decline in steel demand.

(3) Steelmaking technology is widely available in the international marketplace. Additionally, other countries have significant leads in the development of new technologies. Based on these factors, we believe that if large scale research is to be carried out in the U.S. it: (1) must focus on the more radically advanced technologies not already being pursued by a large number of other international players (i.e., direct steelmaking rather than direct ironmaking for integrated mills, and net shape casting rather than thin slab casting for minimills); (2) in order to get the best possible results with the widest sharing of financial risk it must be conducted on a joint basis, involving steelmakers, steel end-users, technological research institutions, and the government.

(4) Perhaps of greater importance, however, is the cultivation of a business environment which promotes the capital formation required to employ the latest steelmaking technologies. In short, this would involve a looser monetary policy, a tighter fiscal policy--aimed at lowering interest rates and stabilizing the dollar, and a tax system which encourages investment rather than consumption.

(5) The industry is not monolithic in nature. The two major sectors, integrated and mini mills, have sharply different operating modes which require the development of different types of technologies. New minimill technologies will enable users to make further inroads into integrated mill product lines: sheet, plate, and structurals. Thus, these technologies will indirectly work at odds with new integrated-based technologies. We anticipate that minimills' domestic steel market share will move from the present 22% to 45% by the late 1990s.

I. U.S. ECONOMIC OUTLOOK HIGHLIGHTS

Our company's current long-term economic outlook is characterized by modest economic growth and a shift in focus from consumption to investment. The distribution of output growth in this country will continue to move away from goods and services for domestic consumption toward goods and services for foreign consumption. By the mid-to-late 1990s, the U.S. will have returned to a position of near balance in the real trade accounts. The following are highlights of our economic outlook:

* We anticipate average annual **Real GNP** growth of 2.5% over the next 10 years--slightly below the 2.65% average rate of advance seen over the 1967-1987 period, and further below what we believe to be the steel demand maintenance range of 2.8%-3.2% growth.

* The rate of **inflation**, as measured by the GNP implicit price deflator, is projected to average 4.4% per year through 1997, down from the average 6.1% increase seen over the 1967-1987 period.

* **Business fixed investment** is expected to grow at a 4.6% annual rate through 1997, versus the average 3.3% rate from 1967-1987. Purchases of capital equipment should outperform investment in commercial structures, advancing at an annual rate of 5.2%.

* **Consumption spending** is projected to slow to 2.2% annual growth through 1997 compared to the 3.2% average growth over the past 20-year period. Since total population growth will also decline slightly from a fairly constant 1% per year from 1967-1987 to 0.8% per year through 1997, real per capita consumption, one often-cited measure of economic well-being, will expand at a sluggish 1.4% per year compared to the 2.0%-2.5% rate of recent history.

* Since the late 1970s, **exchange rates** have become a key driving force for both the steel industry and the economy in general. We believe that the Fed will continue to follow an interest rate policy which allows the dollar to decline in world exchange markets, thereby providing the needed stimulus for improvement in the U.S. trade position. As a result, we expect the dollar, on a multilateral trade-weighted basis, to drop an average 2.1% over the 1987-1997 period with the steepest drops occurring in the 1987-1989 period. By 1997, the dollar will have fallen below its previous low of 91.1 registered in 1980.

II. U.S. STEEL INDUSTRY OUTLOOK HIGHLIGHTS

The major factors influencing our company's long-term steel outlook include declining domestic steel intensity, major market share gains by minimills and semifinished steel converters using foreign-sourced materials, rapid-paced technological advancements, heightened materials competition, and increasing world steel market presence of newly industrializing countries (NICs). Some of the major highlights to our forecast are as follows:

* In view of our economic outlook, we expect **domestic steel consumption** to decline at an average annual rate of nearly 1% per annum over the next ten years. **Domestic crude steel production** will decline more rapidly due to increased semifinished imports and efficiency-enhancing technological advances in steelmaking.

* The steel market will experience **intensified competition from materials** such as aluminum, plastics, ceramics, composites, and other advanced materials. The most intensely contested market in the 1990s will be the automotive sector, wherein plastics are likely to make major inroads in the 1990s.

* End-users, particularly in the transportation and construction sectors, will continue to **demand increasing quality and greater strength-to-weight ratios**. This trend will continue to be both a catalyst for substitution and a dampening factor for steel demand.

* We expect a very **competitive steel pricing environment** to prevail, particularly in the latter half of the 1990s due to the following: (1) increased competition from substitute materials; (2) increased minimill penetration into traditional producer steel markets- their share will move from 22% at present to nearly 50% by the late 1990s; (3) increased market share for semifinished steel converters; (4) increased dependence on steel service centers; (5) higher rates of capital spending at core integrated steel plants which will place upward pressure on both sales volume requirements and market exit barriers.

* We anticipate that the current VRA program will be extended into the early 1990s and that it will most likely include some modifications in the area of semifinished steel imports.

* Direct and indirect **steel exporting** by U.S. manufacturers will expand over the next several years, though direct steel exports will remain below 10% of total U.S. steelmaker shipments.

- **Increases in the number and relative size of finishing companies which import semifinished and hot band steel will continue to grow.** Competition from these companies will lead to downward pressure on domestic crude steel production as well as downward pressure on steel prices. Imports of semifinished steel, excluding wire rod, represented 2.3 million tons, 11% of all steel products imported into the U.S. in 1987. By the mid-1990s, we expect those numbers to more than double.

- Technological advances will continue to lower **economies of scale** for integrated steelmakers with some processes, like coke and iron making, being eliminated entirely. Capital costs, however, will increase sharply for minimills as they move into the higher value-added product lines.

- Over the next ten years, we foresee **increasing incidences of mergers and consolidations within the minimill sector. Most minimill companies currently lack the financial resources necessary to purchase the new technologies needed to gain access to future growth markets such as thin slab casting.** Additionally, we anticipate further spin-offs and closures of less efficient integrated plants. Integrated steelmakers with multiple plants have been focusing their available capital at select locations they deem to be the most competitive. Facilities not in this category have the poorest chances for long-term survival. Moreover, individual integrated mills will continue to **focus on a narrower range of products** in an attempt to reduce cost and investment inefficiencies and to establish market niches.

- The U.S. steel industry has made significant competitive inroads versus its traditional advanced industrialized trading partners in Japan and Europe. However, newly industrializing country (NICs) steelmakers remain more cost competitive. Their primary advantages arise from **relatively low labor and capital costs and the growing ease with which technology can be transferred throughout most parts of the world.** We rate U.S. steelmakers as the most productive in the world on a hours-per-tonne basis, twice as efficient as many of those in the NICs. However, **U.S. hourly labor costs are five-to-ten times as high as countries such as Brazil, South Korea, and Taiwan.**

III. IMPLICATIONS FOR TECHNOLOGICAL DEVELOPMENTS

* **While a new era in steelmaking technology is clearly on the horizon, a new era of increased steel demand is not.** From a long-term perspective, steel demand in the United States remains in the declining pattern that characterizes the fourth stage of classic product life cycle theory. Steel intensity, that is, the amount of steel required to support each additional unit of real GNP growth will continue on a downward trend into the future.

* The geographical implementation of new technologies primarily hinges upon where those technologies were developed, the state of home country steel demand, and the relative international competitiveness of the and how competitive a country is in terms of steel demand, the cost of labor, and the cost of capital. Unfortunately, many steel plants in the United States have been left out in the cold, having relatively high costs for both labor and capital, in addition to being among those nations on the decline in terms of long-term domestic steel intensity.

* In recent years, we have witnessed the prevalence of an economic environment which places a premium on rapid corporate returns. This is largely the result of the inflation which took place in the 1970s. As a consequence, in steel and other manufacturing sectors, managers skilled in finance have been favored over those skilled in engineering. Short-term research and development projects have been favored over longer-term research which often produces major technological breakthroughs.

* As stated earlier, steelmaking technologies have become **easily transferred** throughout the world. Moreover, **other countries have sizable leads in developing** the next generation of steelmaking technologies. Therefore, large-scale research efforts in the U.S. must, in our view, focus on **more advanced technologies than those currently being pursued in other areas.** They must also be characterized by **a cooperative effort involving all parties: steelmakers, steel end-users, technological research institutions, and the government.**

* Over the past several decades, a sizable share of new steelmaking technologies have originated in the United States. Yet, because of either a lack of capital or lack of an incentive to invest capital, those technologies have not been fully developed within or diffused throughout the domestic industry. **Therefore, promotion of a business environment which encourages the capital investment required to apply the latest steelmaking technologies throughout the industry is of vital importance.**

* Overall economies of scale in the steel industry will be decreasing significantly for integrated steelmakers as the result of new technologies. However, relative operating and capital costs for minimills entering the flat rolled steel market will escalate sharply. In fact, these costs are prohibitively high for most minimills today. This is the major reason we feel that the minimill sector will continue to consolidate into a form wherein a few large companies will own the majority of EF-based mills. Steelmaker who can not afford the new advanced steelmaking technologies will find themselves boxed into a very limited and increasingly unprofitable corner of the commodity-grade steel market.

Mr. **Walgren**. Thank you, Mr. Plummer. We appreciate it and turn to Dr. Fruehan.

Dr. **Fruehan**. Thank you, Congressman Walgren.

I am pleased that the Committee on Science, Space, and Technology is concerned with the future of the U.S. steel industry, and I would like to thank you for the opportunity to testify on this matter.

I am Professor Fruehan from Carnegie Mellon University. I am also a director of the Steel Research Center there, which is an industrial-university cooperative center, and I am president-elect of the Iron and Steel Society of AIME.

There is no doubt that the steel industry is critical to the defense and economic health of the country. The industry has recently gone through a critical period when production went to very low levels and the industry lost billions of dollars. The industry survived this crisis by greatly improving quality and productivity and painful restructuring. The recent success of the industry has also been helped by a lower dollar and trade limitations.

However, in surviving this crisis the industry, to some extent, had to heavily mortgage its technical future. Its research and development capabilities have been cut drastically with research personnel reductions of over 65 percent industry-wide. It has reached the point that the technical personnel may not be available in any single company to carry out a major technological development. There is a need not only to pool the industry's financial resources but also its technical resources to carry out research and development into new processes, as in the case of the proposed AISI steelmaking project that I will discuss later in detail.

I will focus my comments in the area of new steel-making processes, current research programs, and future research needs in these areas with an emphasis on long-term research. New processes in steel-making will be required to improve quality and decrease costs, which is essential to the international competitiveness of the industry. In particular, new iron-making processes and processes to produce ultra-low carbon, nitrogen, and phosphorus steels are required.

Independent research should still be done on new products and quality improvements, but for large-scale process developments industry collaboration with Federal assistance is the only way that these can be accomplished. We must realize that we are in a worldwide economy and collaborative programs with government assistance are being carried out in competing countries. In the area of basic and long-term research there is virtually little capability left in the industry, and the capability in universities is also declining. Therefore, particularly in the area of basic and long-term research, collaborative efforts with Federal assistance is necessary.

The American Iron and Steel Institute has recently submitted a proposal to the Department of Energy on a new direct steel-making process as part of the Federal Steel Initiative. This is, without a doubt, the most exciting research planned for new steel making decades. It would replace the iron blast furnace which has been the primary method of producing iron for over 500 years and the basic oxygen steel-making furnace. It is also exciting because the steel industry is working together, pulling its technical and financial resources.

The new AISI process would make use of American raw materials such as coal, ore concentrate, and scrap. It would not require coke, therefore decreasing costs significantly. The program is balanced between a pilot plant process development and supporting research activity. This project is critical for the long-term future of the industry, and hopefully work will begin this year.

Another critical area for the U.S. industry is the long-term availability of quality scrap. It takes less than one-third the energy and costs less to produce steel from scrap when compared to production from coal and ore. The U.S. has tremendous scrap resources, but much of this is contaminated with residual elements, in particular, copper, which are detrimental to steel properties.

At Carnegie Mellon, we developed a new concept for removing copper from scrap, and it was highly successful on a laboratory scale. The next step is larger-scale tests to determine the feasibility of a commercial process.

We submitted a proposal to DOE last December for a relatively small amount of money, $250,000 over two years. Despite help and encouragement from DOE, the obstacles in getting started are significant. The program has been reviewed at various levels, and several meetings have been held to fine tune the project. The requirements for DOE funding under the Steel Initiative are complex and designed for multi-million-dollar projects. In this case, it is like hitting a tack with a sledge hammer, and it may cost the Government more money to review the proposal, negotiate the contract, and administer the project than the actual cost of the research. I would say that DOE personnel have been helpful and are attempting to find easier methods of getting this critical research started.

I would suggest streamlining the procedures for small contracts under the Steel Initiative. Partly due to the many complications associated with Steel Initiative funding, as of August 1 only one project has been funded under this program.

Federal funding of basic research from which new processes are developed has decreased significantly in recent years. There is still a significant amount of basic research on steel products primarily because of defense and aerospace requirements but very little in steel making itself.

In terms of constant dollars, funding from the National Science Foundation is less than half what it was a decade ago. The National Science Foundation in 1987, through the Engineering Directorate, only funded seven projects for a total of $500,000 per year on steel making. The Department of Interior sponsors six projects at approximately a total of $300,000 per year through its Generic Research Center program which is only open to land grant universities. This is obviously inadequate funding for major developments.

The vast majority of Federal funding in materials is on new materials rather than basic materials. Let me give you a few examples. At Carnegie Mellon University, we have an Industry/University Cooperative Research Center for Steelmaking. We receive over $600,000 per year from 20 industrial members, including United States Steel, Allegheny Ludlum, and National Steel who are presented here today, but only $50,000 from the National Science Foundation.

Mr. **Walgren**. Dr. Fruehan, I apologize for having to respond to this vote on the Floor. Can I stop you there, and we'll pick right up at that point in eight to ten minutes.

Dr. **Fruehan**. Okay.

[Recess.]

Mr. **Walgren**. Let me call us back to session and apologize for having to interrupt. Dr. Fruehan, please continue.

Dr. **Fruehan**. I was speaking of our Steel Center with a large amount of industrial support but a small amount of Federal support, and I was going to compare that to the new materials research centers which receive over half a million dollars from the Federal Government with no industrial support. NSF engineering centers receive over $1 million per year from NSF with only minor industrial support.

I firmly believe industrial support of research is valuable not only for the cost sharing but for the additional technical support and faster technology transfer. There should be a shifting in Federal funding with basic materials receiving a reasonable percentage of the research dollars in materials. Steel remains, by far, the most used engineering material, and the industry employs more people than any other materials industry.

A much larger percentage of basic research at universities is now funded by the industry. The industry is realizing its responsibility for basic research and for its future needs. However, the industry does not have a large research budget and more help is needed from the public sector. The steel industry is one of the only industries in which funding for universities is provided.

It should be noted that the vast majority of industrial university funding is coming from the established integrated specialty and quality steel producers. The mini-mills, who have been highly profitable in the past decades, have no tradition of funding basic research and have contributed little in this area. In general, the mini-mills have been very innovative in applying new technology but not in developing technology. Good examples are the DC arc furnaces at Florida and Nucor Steel and the thin slab caster planned by Nucor. In each of these cases, the processes were developed in Europe. In the mini-mill segment of the industry, if the mini-mill industry continues to grow, I hope they recognize their responsibility to the future technical viability of the industry and support basic and long-term research.

Senators Metzenbaum of Ohio and Heinz of Pennsylvania are jointly sponsoring a bill to disburse as matching funds for industrial research or fully finance academic programs in order to advance steel-making technology. This program would be administered by the Department of Energy. This proposed legislation is certainly a step in the right direction, and I hope the House of Representatives will consider some of the legislation. I would only suggest streamlining the review systems used by DOE, and industrial participation should be encouraged in all cases, including work done at universities. Industrial participation ensures that the work is relevant and possibly better technology transfer.

In conclusion, the steel industry is vital to a healthy economy and defense. The industry has survived primarily by improving quality and productivity. However, its technical capabilities have decreased significantly, and new and innovative ways of carrying out long-term research are required. The Direct Steelmaking Project of AISI and the industry/university cooperative centers are carrying out collaborative research, hopefully, with DOE funding. This is a good example of how large-scale research projects can be carried out.

The Federal Government and the mini-mills must play a larger role in supporting basic and long-term research. Streamlined funding mechanisms must be developed to sponsor research on new and innovative concepts without the constraints of existing programs. In my opinion, the Federal Government should increase funding for fundamental research in basic industries. This could be accomplished by shifting small amounts of Federal research dollars from the so-called new glamorous materials to basic materials such as steel. An attractive mode of this funding is the university/industry cooperative programs or projects. Industry involvement, both financially and technically, ensures relevant research and improved technology transfer.

Thank you for this opportunity to appear before the committee.

Mr. **Walgren**. Well, thank you; thank you all very much.

I guess the question that comes to mind is, Dr. Fruehan, your emphasis on the steel industry as supplying such a large portion of what is being done collaboratively or in university settings, are there direct explanations for that other than the glamorousness of new materials? Are there other reasons why steel, as a basic material, has not attracted the attention of the NSF? You indicated NSF was more involved in the past than they are now. What went into the withdrawal?

Dr. **Fruehan**. In general, there's been several things going on within the National Science Foundation and other funding agencies. One is the move towards large group research activities such as research centers, and once you do that, you limit the number of initiatives that you can put forward, for example, the engineering centers. There may be several dozen of these at most, and they have to pick those critical areas which they think would benefit the country as a whole better. But this is done at the expense of things that are lower down on their priority list, such as steel making, but I'm afraid that in NSF there is also this trend toward the new, glamorous materials or whatever.

Right now, it is so easy to get funding on superconductivity; anyone in this room might be able to write a proposal that would be funded. But to get something funded on something as basic as steel making is extremely difficult. This is a fact of life that we have to live with.

I would like to encourage the concept of the industrial cooperative centers with more industrial funding as a way of overcoming these difficulties, because now the Government is getting a lot more leveraging of its money and it is really ensuring that there is technical guidance provided by the industry with such programs.

Mr. **Walgren**. You mentioned that collaborative research was being carried out abroad. Are there comparisons that can be made between what we see being done out there? By "collaborative," what do we mean? Do we mean Government-private?

Dr. **Fruehan**. Government-private and industrial, together.

Mr. **Walgren**. And a group consortium as opposed to individual company? Is that the idea?

Dr. **Fruehan**. That's correct. Let me give you two examples, one in Europe and one in Japan. In Europe, they have the Iron, Steel, and Coal Community where they have—each company in all of those countries is assessed so many dollars per ton and the money goes in to sponsor long-term research, and there is also government monies involved in that program as well. In Japan, they have what is now called the National Project. This program was put together by MITI, and it is to develop a new iron-making technology, and they have committed the equivalent of several hundreds of millions of dollars where various companies are working together and the Government of Japan to develop a new iron-making process.

Mr. **Walgren**. I wanted to ask both of the other witnesses. Mr. Plummer was seeing demand clearly not increasing, and I don't know whether you had an exact position on that, Mr. Barnett, but with demand not expanding rapidly, how are we going to make the major research investments if the Government doesn't do it, or doesn't cause it to happen and put some incentives?

Mr. Graham indicated that it is awfully easy to put in place large new capital equipment if you are servicing a larger demand, but if you are servicing a static or declining demand, then financially it just doesn't pay back to make a large new step. Can you comment on that?

Mr. **Barnett**. Yes, I will. As you recall, Mr. Plummer and I have said that there is going to be no or, let's say, declining demand for steel, but Mr. Graham has also mentioned steel traditionally talks in terms of tons, okay? I don't think that is a very useful way of looking at the future. It is true that the tonnage requirements of steel are not likely to grow but to be stable and maybe declining in the future, but the value requirements are quite a different matter.

You heard the gentleman from Allegheny Ludlum talk about the fact that stainless was growing much more rapidly than the rest of the industry, and if you look at the products on a product-by-product basis, you find that the high valued products, generally speaking, are growing much more rapidly than the lower valued products, and so you find much more opportunities to add value to the industry rather than opportunities to add tons. It is the adding of value and the creating of that value which would generate the funds to make the necessary research rather than the creation of tons.

Mr. **Walgren**. Yes. Mr. Graham focused on that as well, and I gather that is really true, that we are moving to quality and to value added.

Mr. **Barnett**. To the extent that we can add more to value, we have much greater opportunity to add to the prospects of the industry than if we just try to produce more tons in the future.

Mr. **Walgren**. Hm-mm.

Do you see foreign groups being able to make these changes more directly than we will be able to be?

Mr. **Barnett**. Not necessarily. I mean if you are talking with the market changes and the quality, and certainly the foreign groups have spent a great deal of effort improving the quality of their products and so on, and I'm not so certain that in their economies the dynamic market forces are quite so evident as in our own. That is, the opportunities might not be so prevalent.

One of the advantages we have here is, there's a lot of changes taking place in our consumers, whether automotive, all the changes taking place there, all the different industries going, the changes in those industries. In some foreign economies, there's more dynamic forces at work, but in most of them there's not, so in many cases we end up having opportunities which they do not have, and they therefore invest here to take advantage of those opportunities, which is somewhat suggestive of where the opportunities lie, but as they're looking to invest here in steel or in steel consuming industries, looking at exchange rates, looking at the forces at work and saying their opportunities are here. So I don't think we can say that their opportunities are greater than ours. I think it is—

Mr. **Walgren**. How about just on the forcing or directing of the research? I mean they can probably see where this thing is going as well as anybody else can, and if they want to be there and they have the ability to orchestrate it in a way that we don't—

Mr. **Barnett**. They have ability to channel their effort where our effort is fragmented a little bit by this company, a little by that company, a little by this Government agency, a little bit by that Government agency. They are channeling their effort, and this one of my, I guess, common complaint of all three of us here is that we're not channeling our efforts to address the major issues. Some of our effort is just completely lost as we spin our wheels.

Mr. **Walgren**. Mr. Plummer, could you address this concept of flat demand or decreasing demand and what is necessary to make—and how that fits with making large changes? You indicate that the other countries have leads in developing the next generation of technologies and therefore you'd like to see us really focus on, I gather, the generation after that, and yet how can we do that with decreasing return, I gather, at least in volume?

Mr. **Plummer**. Well, I really completely agree with the comments that Dr. Barnett has made in that the industry or the growth areas of the industry are clearly towards the value-added type products, those products that Richard Simmons talked about, the stainless steel areas, the advanced coating type steel products, and so those sorts of things, so that in reality, just viewing the market strictly on a tonnage term basis is a little bit illusory.

But our opinion and my opinion is that yes, in fact, technology in the current generation—and I think that was not disputed by either Mr. Graham or Mr. Simmons in the form of ladle metallurgy, continuous casting, that sort of thing, is widely available in international markets, and, in fact, more widely available from foreign sources than from domestic sources. That is not necessarily a bad thing because it is widely available, people can buy it, American companies can buy it.

Therefore, we feel that if dollars are to be invested by steel companies, by the Government, or by institutions like Dr. Freuhan's, that it would make the best economic and financial sense to do that with areas that are not currently being pursued but that are viable in the long term, such as—some of the areas that I brought up and I think the other two panel members have brought up are direct steel making rather than direct iron making, which, in a sense, is in an advanced stage; near net shape or net shape casting, rather than thin slab casting, which a lot of producers are doing, and I think we've all mentioned a few of the foreign companies that are doing this.

Mr. Walgren. Well, all right. Well, thank you very much. I'd like to express our appreciation on behalf of the subcommittee, and we appreciate your being a resource to us, and without some of the time constraints we have perhaps we can talk back with you, and feel free to give us guidance and submission as this record is put together if you have other thoughts on the hearing today. Thank you very much. We particularly appreciate your coming down from Pittsburgh, Dr. Freuhan.

Let me call the last group then: Harry Lunt, a consulting engineer with Bu~~rns and~~ Roe; David Chatfield, the vice president for R&D at National Steel Corporation; and Jim Collins, president of National Steel Producers Association.

Gentlemen, thank you for being so patient with our process, and I realize that it must appear terribly unwieldy. But let me ask you to give your comments in the order in which I introduced you to the record, and any written statements that you'd like to submit, of course, will be reproduced in that part of the record completely, without more.

So, Mr. Lunt, welcome to the committee.

STATEMENTS OF HARRY LUNT, CORPORATE CONSULTING ENGINEER, MATERIALS ENGINEERING, BURNS AND ROE, ORADELL, NEW JERSEY; DR. DAVID A. CHATFIELD, VICE PRESIDENT FOR R&D, NATIONAL STEEL CORPORATION, PITTSBURGH, PENNSYLVANIA; AND JAMES F. COLLINS, PRESIDENT, NATIONAL STEEL PRODUCERS ASSOCIATION, WASHINGTON, D.C.

Mr. Lunt. Thank you, Congressman Walgren.

I have submitted written testimony, and I hope it's read. I think I bring a different perspective to the hearing. I represent, one, a user of steel, and we haven't heard from users of steel at these hearings yet, and I'm here as chairman of the ASTM Committee on Steel, which is a voluntary standards writing organization. The committee that I chair has jurisdiction over about 450 standards for steel products and methods of test. An activity under the jurisdiction of a subcommittee of my committee is international standards writing in the International Standardization Organization, ISO.

From my personal experience, I give two incidents in items number 3 and items number 4 of steel products that, one, I used to work with and recently wanted to buy for a defense project that either are no longer manufactured in the United States or are manufactured to greater advantage, that is, in the case of the thick, 12-inch thick steel plates that we needed. We could get the plates with twice the weight, in other words, twice the size, from

Europe than we could get domestically. I used to work for a steel company in the U.S. that manufactured this product, but those manufacturing facilities are no longer in operation.

From the point of view of standards writing, during the early 1980's in ASTM we saw a decrease in the participation of the steel industry. The number of companies that participated in writing ASTM standards for steel decreased, and the number of representatives from each of the companies decreased, and with the turnaround in the steel industry we have not seen a return of the companies, and we have not seen a return of the representatives or replacements of the representatives. In other words, the steel industry is participating in ASTM's standards writing activities to a much lesser extent than they were before.

In the area of international standards, ISO, the performance was quite disturbing to me. In mid-1986, about two years ago, the American Iron and Steel Institute, AISI, which provided the financial support for the United States representatives working in ISO was discontinued. AISI stopped funding it and asked for the return of the unspent money that they had forwarded for this purpose, and that action has not been reversed.

There is almost a hostility among most of the producers, not all of them, against their employees participating. One fellow told me he was told that not only would the company not support his travel but wouldn't make his time available; if he wanted to do it on his vacation time, that was okay with them. I think this is a very sad observation—outlook of the steel industry. I think it is evidence of something seriously wrong.

I would like to talk a little further on the item of international standardization for steel which I discuss in item number 2 in my written testimony. I point out that the United States has been at a distinct disadvantage in ISO because many employers, particularly user companies, have found it difficult to fund the expenses associated with ISO work. When AISI funds for ISO travel expenses were available, they could be used only for members of AISI—that is, only by producer representatives. Participation has been sparse and producer-oriented.

The Steel Founders Society of America continues to impose similar restrictions on its funding—that is, only producers. Now this is in contrast to the rest of the world. Other countries don't have this problem. Many, like Japan, Mexico, Korea, Poland, Yugoslavia, and the U.S.S.R., fully finance participation in international standardization. Canada and most countries in Western Europe and South America provide a portion of the financial support. My written testimony contains a recommendation for the subcommittee to consider funding this activity, so that the U.S.A. would be on a more equal footing with other nations and so that the participation by nonproducers would be facilitated.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Lunt follows:]

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United States House of Representatives

Committee on Science, Space, and Technology

Subcommittee on Science, Research and Technology

August 4, 1988

Burns and Roe Enterprises, Inc.

Harry E. Lunt
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Mr. Lunt has 38 years experience in materials for power generation. Providing consulting services in materials engineering, metallurgy and welding, he currently is a licensed Professional Engineer in the states of Delaware and California. He was awarded the B.A. degree magna cum laude by Syracuse University where he was elected to the Phi Beta Kappa Honorary Society, and a Master of Science degree by Iowa State University.

He has been active in technical and professional societies concerned with metallurgy and materials science. The American Society for Testing and Materials (ASTM) has presented him with the Award of Merit and Honorary Title of Fellow of the Society. At the present time, he serves as Chairman of ASTM Committee A-1 on Steel, Stainless Steel and Related Alloys. This committee has jurisdiction over about 450 standard specifications for steel products and methods of test. The American Society for Metals also has honored him with the election to Fellow. He is Past Chairman of the New Jersey Chapter of that society. He also holds membership in the National Association of Corrosion Engineers and the American Welding Society.

He has been with Burns and Roe for about 14 years. Formerly, he was with the Worthington Corporation, a manufacturer of heavy machinery. He served there as Corporate Materials Engineer reporting to the Vice President of Engineering, and before that was with the Westinghouse Research Laboratories and with the United States Steel Corporation.

BURNS AND ROE ENTERPRISES, INC.

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Testimony of

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INTRODUCTION

I wish to thank the Subcommittee for this opportunity to express my observations and concerns about the future of the steel industry in the United States.

This industry is important for all the reasons noted in your Charter: Steel Research and Markets of the Future. An additional reason for its importance, indeed for the importance of all heavy industry in the United States, is to support the service economy which we are told is rising from the ashes of the smoke stack industries. Without heavy manufacturing, service industries will have nothing to service but other service industries and government, a questionable route to prosperity, in my opinion.

1. **AMERICAN SOCIETY FOR TESTING & MATERIALS (ASTM) Standards for Steel**

As Chairman of ASTM Committee A-1 on Steel, Stainless and Related Alloys, I have seen in the early 1980's a decrease in the participation of the steel industry in the standardization activities of ASTM with respect to both the number of producer companies and the number of representatives from producer companies. That downward trend has stopped, but I do not see the former producer participants returning. Some of those steel companies are no longer in business, and most of the surviving companies that cut back on their participation are not sending their former representatives nor are they sending replacements.

If this observation is an indicator of the health of the steel industry in the United States, the indication is not favorable.

2. **INTERNATIONAL STANDARDIZATION ORGANIZATION (ISO) Standards for Steel**

In past years, the American Iron and Steel Institute (AISI), a trade association of steel companies, provided the funding for travel of U.S. delegates to meetings of the Technical Committee on Steel (TC17) of the International Standardization Organization (ISO), and the AISI also covered the costs associated with the operation of the Secretariat of the ISO Subcommittee on Sheet Steel (ISO/TC17/SC12), which was held by the United States. This Secretariat is of particular importance because sheet steel is by far the single largest tonnage product worldwide. The United States also holds the Secretariat of the ISO Subcommittee on Steel Castings (SC11); the operation of this Secretariat is funded by the Steel Founders' Society of America, another trade association.

In mid-1986 the AISI ceased funding ISO activities. We in ASTM Committee A-1 received the news with shock because we operated these ISO activities through one of our subcommittees.

This loss of the industry's financial support for the major part of international standardization of steel was a great concern to us in ASTM. We feared that withdrawal of the United States from participation in the development of international standards for steel would seem to the rest of the world to mean that we don't think their ideas are important and we don't need them. In addition, we felt a relationship must exist between U.S. participation in international standards writing activities and export performance. Certainly, success in promoting wider acceptance of standards based on American technology should have a favorable effect on trade. Our expectations have been confirmed by the National Bureau of Standards whose recent report, "A Review of U.S. Participation in International Standards Activities" (NBSIR 88-3698), found such a correlation for several major product categories.

The steel industry's withdrawal from participation in ISO was not unanimous. One steel producer, a major supporter of ASTM, continues to fund the time and travel expenses of its own representative.

I indicated in section 1 above that the decreased activity of U.S. steel companies in ASTM may be considered an unfavorable indicator of the health of the industry. If that is so, the performance of the steel trade association, AISI, in ISO is suggestive of a life-threatening ailment.

The United States has been at a distinct disadvantage in ISO because many employers, particularly user companies, have found it difficult to fund the expenses associated with ISO work. When AISI funds for ISO travel expenses were available, they could be used only by members of AISI, that is, only by producer representatives. Participation has been sparce and producer oriented. The Steel Founders' Society of America continues to impose similar restrictions on its funding. Other countries do not have this problem. Many, including Japan, Mexico, Korea, Poland, Yugoslavia, and the USSR, fully finance the ISO participants. Canada and most countries in Western Europe and South America provide a portion of the financial support ranging from 15 to 90 percent.

I recommend that THE SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY consider funding the USA participation in ISO. Such funding would put the United States more nearly on equal footing with other countries. Funding by the United States should be in the form of a designated gift or grant to the American National Standards Institute (ANSI), the United States member to ISO, or to ASTM, who has been delegated by ANSI to administer the USA participation in ISO. Government funding would correct the present disadvantage of the United States and would permit the United States to be more aggresive in negotiations for secretariats.

For the time being, the ASTM Committee that I chair has alternative funding, and we have been able to continue our ISO activities including the operation of the Secretariat of the Sheet Steel Subcommittee. Our concern is that future funding is uncertain.

3. Gargantuan Ingots for Rotor Forgings

As a researcher for a major steel producer earlier in my career, I worked on an expensive project aimed at improving the uniformity and soundness of the largest steel castings in the world, the huge ingots that are forged into rotors for utility-sized electric generators and turbines. A number of domestic steel companies competed for the lucrative rotor forging business at that time. Today, only one producer remains in the U.S. Just recently I read with interest of research on that same subject being conducted in Japan under the joint sponsorship of a Japanese steel company and a U.S. manufacturer of heavy electrical equipment.

The resurrection in Japan of a long stagnant steel development initiated in the United States is a sad illustration of the decline of heavy industry in the U.S. in general and of the domestic steel industry in particular. It reflects unfavorably on the ability of industry in the United States to compete on the international scene and on its ability to respond to the needs of our defense.

The steel industry cannot reverse this decline until it learns how to take back customers it lost to imports and applications it lost to other materials. The mechanism for such learning is research and development, an activity that is most difficult to support when you just barely are making the payroll. The SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY should consider how the government may stimulate steel companies to invest and invest heavily in that learning process.

4. Heavy Steel Plates

A defense project I worked on recently for my present employer further reflects on the decline of the competitive posture of the domestic steel industry over the years and on its ability to repond to defense needs. The project required the use of unusually thick (12 inches thick) steel plates. The steel mill in which I worked 30 years ago made such plates. Unfortunately, that mill is closed, and no other mill of that major steel producer can make the product.

Indeed, only one source for 12-inch-thick steel plates exists in the U.S. today.

Another important parameter for the plates for this project was overall size. It was necessary to use the largest pieces obtainable to minimize the amount of welding needed to join the plates. A French steel company was able to make plates in pieces with double the weight we could get from the lone U.S. producer. The presence of this productive capacity in France indicates that markets for such heavy steel exist elsewhere, and that other countries are getting the business. As one of the consequences of the general decline of heavy industry in the United States, the need for heavy plates has declined, and this loss has all but eliminated the United States from the markets for heavy steel.

The production of heavy steel plates is vital to the defense of the nation. Yet, the steel industry in the United States seems not to be involved in improving the process by which steel plates are produced. Major developments, like the Thermomechanical Control Process (TMCP), have come out of Asia and Europe while domestic producers, when stimulated by such overseas developments, seem to limit their response to COPYING the new methods that are developed elsewhere.

I recognize that even the evaluation of an emerging technology presents financial demands of very major proportions since it may involve interrupting production at a time when very few facilities are available to produce, or it may require the construction of a pilot facility.

This is another illustration of the need for the government to stimulate the industry or to join the industry in major research and development efforts.

5. An Evolving Industry

The steel industry today is markedly different from the one I joined on leaving graduate school in the early 1950's. Then, the industry was dominated by a few large companies. The major steel producers were interested in steel products that they could mass produce in large tonnage. Small producers existed by concentrating on specialty steels which were needed in relatively small quantities, only. The small producer flourished because specialty steels sold at special prices.

Today, production in the United States of heavy steel products such as plates, large structural shapes, and heavy forgings has shrunk due in part to the reduction in manufacturing in the United States and to other causes already noted by the Subcommittee. The steel industry has reoriented itself. Integrated steel mills have given way to minimills. Numerous small producers dot the industrial landscape now, and the changes are continuing. These small producers make the common steels, not specialty steels, and they prosper because they make them more economically than the major mills.

These changes may be viewed as improvements in the health of the steel industry in the United States. On the other hand, the United States has lost a major manufacturing capability that would be vital in time of war.

Major contributors to the evolution in the steel industry in my opinion may have been (1) an overemphasis on short term profitability over long term competitiveness, and (2) a reluctance to accept the risk of takeover that is associated with the accumulation of the vast funds needed for major research and new plant constructior. The SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY may consider incentives that would encourage long term planning and would reduce the threat of takover for companies with money in the bank.

6. Research

The Subcommittee's Charter notes the reduction in research by steel companies to a small fraction of the effort of a decade or two ago.

However, cooperative research today addresses some major developmental work. For example, the Center for Metals Production in Pittsburgh, Pennsylvania is conducting collaborative research on electric steelmaking that can improve the productivity and energy efficiency of steel production. Much of this work is funded by leading steel companies, electric equipment manufacturers, and electric utilities.

The Center for Metals Production was established in 1984 by the Electric Power Research Institute (EPRI) and is administered through the Mellon Institute of Carnegie-Mellon University. EPRI itself is a product of collaboration. It was founded in 1972 by domestic electric utilities to develop and manage a technology program for improving electric power production, distribution, and utilization.

Improvements in electric steelmaking furnace technology already have reduced the time required to produce a batch of steel in an electric arc furnace and the electric energy consumed for each batch. Further research is expected to continue such improvements and also to effect more fundamental changes in the process such as using dc electricity in place of ac and using novel methods to reduce the impurity content of the steel so as to enhance desirable properties in the steel.

Development work like the above is applied research aimed at incremental improvements in existing technology. What we no longer have in the domestic steel industry is basic research that may lead to new and different technology with the promise of leading rather than following the international competition.

In the steel industry, research, like new plant construction, requires the expenditure of vast funds that presently exceeds the financial capability of the industry. Cooperative research is one viable way to raise the needed money. However, research, whether cooperative or individually sponsored, is in need of financial incentives because industry has a long way to go to be able to meet the needs of the United States.

Mr. **Walgren**. Thank you, Mr. Lunt. We appreciate that.

Let's continue and go to Dr. Chatfield for ten minutes, and then I'm going to have to run and get that vote, and then we'll come back to Mr. Collins. But we do have a good solid ten minutes, Dr. Chatfield, we can use to hear your testimony.

Dr. **Chatfield**. Thank you, Mr. Chairman. I appreciate the opportunity to be able to testify here today.

I am David Chatfield. I'm vice president of technology for National Steel Corporation. My background is metallurgical engineering. I've been with National Steel for 23 years in a variety of R&D operating and quality control and general management activities. My current position involves responsibility for R&D, engineering, energy, and environment for National Steel.

I would like to perhaps just summarize my written statements. Some of them are repetitive, and certainly I'd like to get to perhaps the heart of the matter. The National Steel Corporation is the sixth largest steel producer in the country. We produce about five million tons of steel. We hire—employ 12,000 people in Indiana, Michigan, and Illinois and some small number of people in Minnesota. We are a producer of flat rolled steel products, and flat rolled means from slabs to sheet and strip. Flat rolled carbon steel accounts for about half of the steel shipments in the United States. It is the primary raw material for automobiles, which is probably—automobile suppliers are our biggest customer, automobile assemblers and suppliers. It is also used in pipe and tube products, steel buildings, containers for food, steel furniture, and so on. It is a major raw material used for many, many implements that we use in the United States and around the world.

Steel is a very high-tech business. We once had the image, I think, and maybe still have the image, of being a kind of smoky, dirty operation that is more brute force than anything else, but it involves rather large forces, high temperatures, high speeds, and it is a very sophisticated business to control that with computers and other things.

Competition in our business is very keen. We have world-wide competition, and our customers are putting greater demands upon us all the time to produce products that have lower cost, that have significantly higher quality and much tighter variation in terms of strength, dimensions, formability, and so on, and our customers are asking us continually for more technical assistance, so that there is a synergy between our two organizations, supplier and customer. All of this is putting a very heavy load on technology, technological improvement to bring about many of these improvements that our customers need, and we don't see any easing of that need for technological improvement.

The industry and National Steel have made large investments in technological improvement over this decade. It has been very costly at a time when our profits have been negative, and it has put something of a burden on us to upgrade our facilities while, at the same time, suffering large losses, and, as I say, both the industry and National Steel have gone down similar roads in that regard.

It is unfortunate that perhaps during this period of time of a need for greater technology and a greater investment in technical facilities our R&D efforts have maybe nonuniformly but in almost all cases have declined and suffered. Our R&D and technical innovation activities have shrunk, and, as I say, National Steel is no different from the rest of the industry in that regard.

However, we do maintain a strong activity, not as much as we would like but an activity that helps support our operation in the R&D effort at this time. We employ 102 people in our research and development activity—scientists, engineers, and technicians—and we spend about $15 million on that each year.

I'd like to spend a minute talking about how that effort is focused. We have two separate types of technical activity in the R&D area. One is what we call our technical research centers that are devoted to improving our operations, trying to make the equipment do better, upgrade the equipment, but basically related primarily to the process.

On the other hand, we have a Product Applications Center where our technical people are devoted to the idea of having a good interface with our customer on a technical basis, whether it is automotive, building products, or whatever, having an interface with him both in terms of knowing what his long-range technical direction is as well as the current problems he's having in his plant today with our products.

Now both of these activities are very important to us, improve the operation, and serve our customer, and understand where our customer is going so we can be there when he wants to have something new. I should say, though, that these people are rather narrowly focused. They are focused on what we see right now. They are focused in many cases on day-to-day problems in our plants or with our customers.

We do not have the depth to be looking at very long-range activities. We are not involved in basic research. We are not involved in the creation of a word that perhaps has not been viewed too favorably here today; we are not involved in leapfrog technology within our own R&D activities. Rather, we depend upon universities and colleges, and I think in terms of the purpose that we have here today, we feel there probably is a role that Government could play in developing revolutionary, or if you want to call it leapfrog, technical developments that we are not able to do because of the risk, as Mr. Graham talked about, or the size of the activity. We think that Government has a large role to play in support of those kinds of activities, the several areas that seem important to us. You have heard them here already, about continuous iron and steel making, a very important area. It is one that we cannot afford to do by ourselves, but it could have a major impact on us in the future.

Mr. WALGREN. Let me ask you to hold that thought and come back to it when I come back, if you could all stay with me. I'm sorry I have to run over there, but the bells indicate that, and I'll be ruled out if I don't leave now, but I'll be right back in just a couple of minutes.

[Recess.]

Mr. WALGREN. Let me call us back for the last time, and, Dr. Chatfield, please pick up where you left off. You were saying that there was certainly an important role for Federal involvement in several areas.

Dr. **Chatfield**. Well, going back just a tad here, as I say, our R&D efforts are relatively short term and not directed towards the long term or the long-term project nor the, what I would call leapfrog or revolutionary kind of improvement. We depend upon universities, and we think it would be reasonable to depend upon large multi-company/Government-supported projects in those areas where there is high risk and a very long and expensive development program necessary.

Some examples of these areas, several we have heard today about continuous ore to liquid steel making, the near net cross section casting methods, or slabs, or other types of metal shapes, steel shapes, the more flexible manufacturing system that will allow us to economically produce small quantities, order sizes for customers. These are all areas where a lot of effort is required and no one company can handle it by themselves.

I think ways that Government may find to support such activities are very appropriate to support the R&D effort in the steel industry. The Steel Initiative and the project that was submitted last week is a very good example of how Government can work to help us make a major change in the way we do business, in the way we make our product. That is a very large project. As Mr. Graham said, it's one that had quite a good deal of risk and will probably change during the life cycle of the project, but it's one that could cause a revolutionary change in how we use our raw materials. A perfect example: I think Government should seriously consider such approaches and perhaps expanding such approaches.

Domestic industry has been making a number of very painful adjustments with the new global competition that we have. We are doing this in competition with steel industries in countries where the industry is supported by their governments in various ways.

Steel is a vital national resource, the ability to make steel. We think it needs and deserves the support of Government in the ways that I have discussed.

Thank you very much.

[The prepared statement of Dr. Chatfield follows:]

STATEMENT OF

DAVID A. CHATFIELD
VICE PRESIDENT-TECHNOLOGY
NATIONAL STEEL CORPORATION

BEFORE THE

SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY
COMMITTEE ON SCIENCE, SPACE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

AUGUST 4, 1988

Mr. Chairman and members of the Committee. Thank you for the opportunity to testify today.

My name is David A. Chatfield. I am vice president of technology for National Steel Corporation. By profession I am a metallurgical engineer with a PhD from Ohio State University. I have been with National Steel since 1965 when I went to work in the research and development department. Later I moved to National Steel's operating divisions where I held quality control and operating positions. From 1984 to 1987, I served as vice president and general manager of the Midwest Division, a finishing mill that produces about 1.5 million tons of flat rolled steel products a year.

I am here today to tell you about the vitally important role that technology plays in our business and the part it will play in its future.

My company, National Steel Corporation, is the nation's sixth largest integrated steel producer. This year we will sell about 5 million tons of steel products which will produce revenues of roughly two and a half billion dollars. That will account for about 6 percent of the domestic steel industry's business. We employ some 12,000 people, most of whom work at three plant locations in Michigan, Illinois and Indiana - the nation's heartland. Our headquarters office is in Pittsburgh and we have smaller operating units and sales offices throughout the east and midwest.

My company makes flat rolled steel, the product which, in its many variations, comprises more than half of the domestic industry's total shipments. Our biggest customers are the auto manufacturers and their suppliers. Our products are also used for the manufacture of such things as pipes and tubes, metal buildings, cans and containers, and steel furniture.

Many people have the impression that making steel is a relatively low-tech business and in the past that may have been the case. But it is far from true today. In response to an increasingly competitive environment and to the demands of its customers, the steel industry has become a high-tech industry in every sense of the word. The steel industry is one of the leading users of high technology. Significant portions of the production process are automated. Computers are used to control the highly sophisticated equipment that's required to meet market demand for ever improving product quality. My company is committed to the proposition that our long-term success depends on our ability to apply the most advanced technologies to our products and production processes.

Worldwide competition in the steel industry and among its customers has made it imperative that we find ways to make steel and steel products at the lowest possible cost. We are competing not only against imported steel and steel products, but against competing materials, such as plastics, ceramics, and other substitute materials. Our customers are facing the same kind of global competition that we are. They are tightening their specifications on the physical properties of steel, such as strength, formability and hardness and the tolerances on dimensions such as width and thickness. They are asking for specialized grades tailored to the manufacture of specific parts and products. They want steel with better protection against corrosion. They want not only high quality, but consistent high quality. They do not want their production lines halted because of defective steel. They also demand better service, which means more responsive and efficient order processing and delivery on very tight schedules.

The customers also want technical assistance in the application of steels to their manufacturing processes and immediate help when they encounter production line problems. Technology alone cannot provide all the answers to these challenges, but we will not be able to respond effectively without advanced technology.

As we look down the road, we see no easing of the competitive environment. In face, as the domestic steel market continues to shrink, as worldwide overcapacity continues to be a fact of life and as our customers continue to face vigorous global competition, we believe the pressures on the domestic steelmakers can only intensify.

The American steel industry has been investing heavily in new technologies... to the extent possible with limited financial resources...to stay abreast of these market changes. The investments continued during the early years of this decade, when the industry racked up $12 billion in losses. Billions have been spent on the installation of continuous casters, ladle metallurgy, electrogalvanized lines, continuous annealing facilities and a variety of technologies that remove impurities from steel and assure more consistent steel quality.

It is ironic that the industry has had to purchase many of the newest technologies overseas. That certainly reflects the current inadequacy of the American R&D effort. During the period when the industry was contracting, most companies cut back their R&D programs, eliminating research that had been working toward major technological advances.

Currently, my company...National Steel...has an R&D effort that involves 102 research scientists, engineers and technicians. They have an annual budget of about $15 million. Our program is manufacturing and customer support.

We recently opened a new Technical Research Center in the Detroit area, not far from our largest steel plant...the Great Lakes Division. We moved the Center to Detroit from Weirton, West Virginia, so that it would be closer to our largest customers, the automakers. A similar satellite operation is located near our Midwest Division in northern Indiana. These facilities are staffed and equipped to apply advanced technologies to National's products and production processes. They work with our steel plants on a day-to-day basis in the areas of primary steel production, steel finishing operations and sophisticated analytical services.

In addition to its high tech measuring and analytical gear, the Technical Research Center has equipment that can replicate in miniature almost every phase of the steelmaking process. It is deeply involved in the modeling of production processes so as to establish optimum standards that the mills can apply to upgrade product quality and improve operating efficiencies.

The other arm of the R&d program is the Product Application Center in Livonia, Michigan, again close to our customers. This facility is designed to provide customers with held when they encounter production problems using our steel. The Center implements our early vendor involvement program...in which we work with the customer early in the design stage of specific parts or products and help develop the specifications for the optimum steel grade for each application. The PAC is staffed mainly with applications engineers and has a certain amount of lab equipment. It uses the lab facilities of the Technical Research Center when necessary.

As you can see, our approach to R&D in our present circumstances is entirely pragmatic. Our researchers are primarily day-to-day problem solvers. We leave fundamental or theoretical research to the universities, which in our opinion, are in a better position to carry out the extensive and lengthy engineering and developmental work required to convert fundamental scientific research into major new processes. Neither National Steel nor, in many cases, the domestic industry have the financial resources to achieve technological breakthroughs of the kind that will be needed in the future to keep the industry competitive worldwide.

The unfortunate truth is that National Steel is, as are many other companies in the domestic steel industry, in the position of playing catch-up, from a technological standpoint, to many of our overseas competitors. The enormous capital cost of that effort leaves no money for research in leapfrog technologies.

My company, for example, is implementing a $1 billion capital improvement program to bring our production processes up to modern day standards at every stage of the production process. That program has included a second continuous caster, and electrogalvanizing line ad ladle metallurgy station at our Great Lakes plant, at a cost of nearly half a billion dollars. We will soon begin construction of a vacuum degasser to improve our ability to produce quality steel at Great Lakes. That will cost over $50 million. We are in the design stage of a second continuous caster at our Granite City plant which could cost over $100 million.

I should note that National is well ahead of the rest of the American steel industry in the utilization of continuous casting. Our Great Lakes plant now produces 100 percent of its steel through casters and the corporate percentage is 90 percent, which is on a par with the Japanese industry. The second Granite City caster will bring us to 100 percent.

In addition to this new equipment, we are spending millions of dollars at all three plants to upgrade existing facilities. The latest example is the $60 million rebuild of our largest blast furnace at the Great Lakes plant. That investment will increase furnace capacity by more than 20 percent, reduce operating costs and improve the quality and consistency of our hot metal. We are adding new generation gauge and shape controls to our finishing mills to improve product quality. We have computerized many processes and have added sensing and other data gathering devices at many points in the process. Our domestic competitors are doing the same kinds of things to a greater or lesser extent.

But, as I said before, all this spending is designed to provide us with the benefits of today's technologies so we may be competitive in the short term. It will not produce the leapfrog technologies that are waiting in the wings and will create the steel industry of the future.

Here are some examples of leapfrog technologies that have been developed in the past and some that might come along in the future:

- continuous iron and steelmaking from iron ore to liquid steel
- near net cross-section continuous slab and billet casting
- a flexible manufacturing system that could efficiently make steel products in small lots

While developments like these are too big for any single steel company to conduct alone, we can be sure that if we are not in a position to accomplish these our foreign competitors will beat us to it and we will have to play catch-up once again. It is our feeling that if the American industry is to be in the forefront in developing leapfrog technologies, we will probably need the assistance of our government. A bill recently introduced in the Senate, that would make the research and development tax credit permanent, is a positive step in the right direction.

Many foreign competitors have had the support of their governments in this area for years and it has given them a distinct advantage over us in R&D. Here are two examples:

> In Europe, Sweden probably has the highest level of government support for steel R&D. There, government aid to the steel industry is administered through a specific department that has a defined mission and full funding authority to carry out its program. There is an integrated R&D plan that focuses on three major areas: materials, process productivity and energy conservation. Sweden's technical research agency works in close harmony with its iron and steel trade association to define R&D needs and coordinate activities. About $10 million a year is devoted to the program, which for the size of the country, is a fairly large amount. A proportionate level of support for the U.S would be $420 million.
>
> The other example is France, where the R&D effort is primarily conducted by IRSID... an iron and steel research institution with some 750 researchers. Although IRSID is funded by the French steel industry, it is indirectly subsidized because the industry itself is heavily dependent on government aid.

We believe the U.S. government could support the development of leapfrog technology by helping to fund research carried on by an industry group such as the American Iron and Steel Institute. The research could be conducted by an independent laboratory...perhaps one associated with a university. Or it could be carried on in a government supported research facility, such as the Argonne or Lawrence Livermore laboratories. In either case, the government and the industry would share the cost and direction of the program. This approach has at least one precedent in the government program to facilitate energy conservation.

We believe this proposal merits your serious attention. The domestic steel industry has been making a painful readjustment to the new realities of global competition. It has done so in competition with foreign steelmakers who have the backing of their government. The industry has survived as a vital national resource. It needs and deserves the support of its government in meeting the technological challenges that lie ahead.

Thank you for your attention.

Mr. WALGREN. Thank you very much, Dr. Chatfield. We appreciate your participation in these hearings.

Mr. Collins.

Mr. COLLINS. Thank you, Mr. Chairman.

I am appearing today for Dr. Gordon Geiger, who was to be our witness. He asked me to express his apologies that he was unable to attend, and I shall try to get through the main points in his statement in about four minutes, recognizing the time limitation.

Most of the new technology being purchased and installed in the American steel industry today is designed, developed, and engineered overseas. As an example, at North Star Steel's recently built seamless pipe mill in Youngstown, Ohio, the company utilized the best combination of equipment that it could find. That included a reheat furnace from Italy, a saw from Russia, a piercer from Germany, a pipe mill from Italy, and a sizing mill from Germany, and that is not at all an unusual situation in the American steel industry today, Mr. Chairman.

During the past 12 years, the American steel industry's collective average spending for research and development has ranged between five—five tenths of 1 percent and six tenths of 1 percent of total sales.

The American steel industry is second only to Japan in spending on steel research, but the Japanese are spending almost twice what we do. Japanese steel makers have invested an average of slightly more than 1 percent of total sales on research and development since 1975.

The recent annual forecast of the Battelle Memorial Institute estimates that total funding for U.S. iron and steel research during 1988 will total $724 million, however. Of that total, Battelle says that the industry will invest $505 million, with Federal agencies spending $219 million. That is certainly significant funding, but it's still small compared to Battelle's projection of total U.S. research and development funding of $131.5 billion annually in the United States. That means that the United States is spending just over one-half of 1 percent of total research funds on steel-related research.

We appear to have several serious problems in research: first, difficulty in moving from basic research to commercial reality; two, lack of direction and coordination of steel-related research by various Government and university laboratories; three, an inefficient scattering of physical facilities for pilot scale development among many locations; and, four, an inefficient scattering of funding.

The challenge, of course, is to identify user and producer needs, to set requirements, and then find solutions. To quote a recent conference board study, change involves a recognition that the line between basic and applied research is blurring and that greater interaction is needed between basic research and technology development. We have come to realize that the innovation process is not sequential, meaning that pure science leading to technology and then to economic opportunity is not necessarily going to happen. It involves instead a strong coupling both ways between technology leading to economic opportunity, and basic science, but it's a two-way flow; it doesn't flow from pure science to commercial application, it can go both ways, and each is stimulated and dependent upon the other.

There are many research operations around the world, and I'll just list a few of them. The British Iron and Steel Research Association, BISRA, was notably successful during the time that it was operating in the British steel industry. It was continued in the early 1970's when British steel producers went through a restructuring process.

Other examples of practically focused Government-funded laboratory research for steel include France's IRSID Organization, Belgium's CRM Organization, West Germany's German Professional Metallurgy Society, as well as the Max Planck Institutes at several German Federal universities that do a combination of fundamental and development research in close conjunction with industry. There are also many other examples.

The Japanese are also very good at this. They have established major pilot facilities at a number of universities. Those facilities are staffed by industrial research engineers on loan to these facilities. All the major Japanese steel companies are also members of a number of consortia focused on major materials technology.

Most of our competitors are doing coordinated, practically focused Government-supported steel research. We are doing far less.

Failing to have a centrally located research and development organization and facility for steel and metal-working technology development puts the United States permanently behind many of its competitors. Those whose attitude is, "We'll adopt the best new proven technology" are consigning U.S. industry to remaining five years or more behind the latest technology and its application.

Therefore, it's Dr. Geiger's belief, which the NSPA strongly supports, that we need to create a steel development center in the United States. It could be accomplished at no incremental cost to the U.S. Government by redirecting a portion of money now spent at several U.S. Bureau of Mines research stations, some of the money spent by the DOD, money spent by the Department of Energy at various locations and in the Steel Initiative, some money spent by the NBS and the National Science Foundation, as well as by NASA and the Department of Transportation. Those funds which Battelle estimates may total $219 million could provide as much as $100 million of operating funds for the center. Industries, could also contribute funding perhaps through contract research or a check-off for each ton sold.

Such a center should be operated by an independent board of directors and administered by persons with experience at running multi-client operations with commercial goals. The board of directors of the center should come from steel consuming industries and steel producing companies as well as Government and the universities. Direction and choice of projects should be based on mutually agreed upon and well defined goals and could include basic research if it would support the ultimate commercial goals.

An example of such an organization funded by and reporting to the Federal Government is the Gas Research Institute, and we would respectfully recommend, Mr. Chairman, there should be a comparable Steel Research Institute.

The equipment for such a center and sites are available at various locations through the country. The current problem is that the equipment is scattered and underutilized. Most of the equipment is owned by existing Government agencies or universities, none of which are thoroughly integrated to carry out meaningful new product or process scale-up work. The equipment needs to be centralized so melting, refining, casting, rolling, forging, coating, and other work can be done so that properties and economics of new processes and products can be evaluated on full or pilot scale.

There is a genuine need for a good national laboratory on steel and metal processing. Such a facility could be financed with existing funds. It could be assembled and operated, we believe, at little extra cost, but it requires making hard decisions about how serious we are about making the U.S. steel industry and the related major metal-working industries more truly competitive. It will also require decisions to discontinue unneeded research currently being done and to reallocate funds for that purpose.

We believe that S. 2470, introduced in the Senate by Senator Metzenbaum, begins to address these problems. The NSPA supported the enactment of S. 2470. The bill directs coordination between the Bureau of Standards and the Department of Energy steel research. It addresses the needs for proprietary rights flowing to those who need an incentive to commercialize the results.

However, we wish to emphazise, we believe that defining projects in a bill, is not the way to proceed in producing legislation for steel R&D legislation and that such definition should come from a steel research board of directors consisting of users, producers, and appropriate Government officials.

In our judgment, the Federal Government's role should be to mobilize the various factions doing steel research into a cohesive organization dedicated to enhancing the competitiveness of U.S. steel makers and their customers. Under such a program, steel consumers, steel producers, and the Federal Government could decide jointly what projects are needed to bring steel research to commercial fruition.

Establishing a National Steel Development Center with pilot plant capabilities would greatly aid technology transfer. The equipment and facilities all exist somewhere; so does the budget if proper reallocations are made.

Any new initiatives in U.S. steel research should emphasize goals based upon real world needs of both steel producers and steel users. Not involving these two groups will consign the United States to remaining far from the vanguard of steel research and technology development. The present system can be improved. We hope the Congress will improve it.

Thank you, Mr. Chairman.

[The prepared statement of Dr. Geiger follows:]

TESTIMONY BY

DR. GORDON H. GEIGER
EXECUTIVE VICE PRESIDENT
TECHNOLOGY, QUALITY & PRODUCTIVITY
NORTH STAR STEEL
MINNEAPOLIS, MINNESOTA

BEFORE THE

SUBCOMMITTEE ON RESEARCH AND DEVELOPMENT
OF THE
U.S. HOUSE OF REPRESENTATIVES COMMITTEE ON SCIENCE AND TECHNOLOGY

AUGUST 4, 1988

I am pleased to have this opportunity to present my views to your subcommittee on the subject of steel research. The views expressed also represent the opinion of North Star Steel President Bob Garvey, who serves as president of the National Steel Producers Assn., a group of electric furnace steelmakers.

By way of background and qualifications, in addition to my North Star Steel duties, I am senior vice president of Cargill, Inc., NSS's parent company. North Star Steel is the largest electric furnace mini-mill company in the United States with current production capacity of 2.7 million tons of continuously cast steel. Its products range from reinforcing bar, wire rod and structural shapes to special quality forging and automative bars and seamless, oil-country pipe.

Prior to joining North Star Steel in 1983, I worked for the Chase Manhattan Bank as vice president and technical director for steel-related lending. The majority of my career before that was spent in the academic world as a professor and department head of metallurgical engineering. During that time I consulted for and conducted industry-supported research on many steel-related processes. The research was always done with graduate students and resulted in 15 Ph.D.s and 35 M.S. degrees being granted to them. I also served as chairman of the advisory panel to the Office of Technology Assessment which resulted in the 1980 report to Congress on Technology and Steel Industry Competitiveness. I also spent full-time in steel-company research laboratories on several occasions.

I give you this background to indicate that I have had experience in steel-industry processes, product development and research throughout my career.

The 1980 OTA report quite properly identified the overwhelming need for traditional, integrated steel companies to modernize technologically in order to compete. In particular, it identified the need for more continuous casting and modernized rolling-and-finishing equipment. Since that report, the industry has invested in these types of facilities. But--equally important--it has closed obsolete mills that no amount of additional investment would have revitalized and on which investment could not have been repaid because of excess capacity. It should be pointed out, however, that a significant amount of new investment has been financed by foreign financial institutions of foreign steel companies and involve major debt loads for the owners.

Most of the new technology being purchased and installed in the American steel industry today is designed, developed and engineered overseas, particularly in Europe. As an example, in our recently built seamless pipe mill in Youngstown, Ohio, we utilized the best combination of equipment that we could find. It turned out to include a reheat furnace from Italy, a saw from Russia, a piercer from Germany, a pipe mill from Italy and a sizing mill from Germany. This is not unusual.

The reason for this is the weakened financial condition of the American steel industry. That condition has not allowed it to participate in the development of new technology conceived by the American capital goods industry, which has historically been the source of much of the industry's new technology. Such firms as Allis-Chalmers, Dravo, A.G. McKee, Lectro-Melt, Pennsylvania Engineering, Mesta Machine, Wean-United, Swindell Furnace Co. and E.W. Bliss used to run pilot plants where they would develop new processes to sell to the industry. Large scale trials of new processes required funds on the order of tens of millions of dollars. In the past, that involved cost sharing by the capital goods companies and the steel industry. Today all of the companies mentioned above have either disappeared through bankruptcy, merged or been purchased by others or have shrunk in size. Their manufacturing and pilot-test facilities have been eliminated or drastically reduced along with their activities in new-process development.

Now I would like to tell you a bit of steel-research history that illustrates some of the points I want to make in my following remarks.

About 25 years ago a number of very capable researchers from several American steel companies banded together to form a joint venture research organization with the U.S. Bureau of Mines to study how the iron blast furnace works. Funding was joint industry and government and the work was done at the Bruceton pilot facility of the Bureau. Much good data came from that project, paving the way for improvements on full-scale furnaces. Unfortunately, no one in the industry can think of anything anywhere near as useful that has been done for or with the industry by that government agency since.

Another lesson involves the purchase of a rotary forge by the U.S. Army. The Army insisted that it be located at Watervliet Arsenal, where its utilization would be negligible, instead of locating it at an industrial plant where all the gun barrel steel for the arsenal is melted, cast, forged and trepanned. The industrial plant would have paid the U.S. government a considerable amount of rent to fully utilize the equipment to make commercial products as well as supply all the military needs with only about 10% of the unit's capacity. So now, instead of being integrated with ESR, heat-treating, press-forging and other technology, that piece of equipment sits isolated in glorious solitude in a government laboratory.

During the past 12 years, the American steel industry's collective average for research-and-development spending has wavered between 0.5 and 0.6 percent of total sales. The United States steel industry is second only to Japan in spending on steel research, but the Japanese are spending almost twice what we do. Japanese steelmakers have invested an average of slightly more than 1 percent of total sales on research and development since 1975.

The recent annual forecast of the Battelle Memorial Institute estimates that total funding for U.S. iron and steel research during 1988 will total $724 million. Of that total, Battelle says that industry will invest $505 million, with federal agencies spending $219 million. That's significant money, but small potatoes compared to Battelle's projection for total U.S. research-and-development funding of $131.5 Billion. That means that the United States is spending just over one-half of one percent of total research funds on steel-related research.

I recently served on an NMAB panel, one of many involved in another of the seemingly endless series of studies of materials policy undertaken in the past two decades, in which we examined, via a series of case studies, how, or indeed if, materials techonology has an impact on the national economy. I've not seen the final draft of that report, but I can tell you my own conclusions. It was quite clear that, time-after-time, American basic research became the basis for Japanese commercial products rather than American.

It was also clear that primarily only projects protected from market risk, i.e., funded by the Defense Department or by profit-guaranteed government-regulated organizations such as Bell Labs, were successful in reaching technological fruition. And in many of those cases, the subsidy required by the taxpayers to produce the few pounds of annual product involved was huge. Few could be considered commercial successes that had significant impact on the economy.

So here we are with the government apparently spending a lot of money on steel-related research and development and what are getting for it? To me, the results are invisible. So I asked the Cargill Information Center to survey a whole series of government and university laboratories, agencies and offices to get some specifics on how much is being spent and, in general terms, on what topics.

The results of that survey are painful testimony to the lack of communications and coordination in those research endeavors. We tried to get responses to general questions. We weren't attempting to steal trade secrets. We asked:

1. What are the major types of steel or metals research going on in your lab?
2. What is the order of magnitude of spending on this research?
3. What areas of metals research need to or should be done that are not being done now?

Answers received indicated to us that there is no coordination of research endeavors within the government and no concept of total steel research funding or agreement as to precisely what areas of research need to be investigated. I can only conclude, on the basis of the few numbers I was able to get, that Battelle's estimate of $219 million is probably not too far off, with about $15 million at the Bureau of Mines, several million each at NBS and NSF and the largest amount at DOE and by DOD. None appears to know much about what the others are doing, or to even care. They are simply spending their pot, apparently on their ideas of important topics.

Another story. About four years ago, we at North Star Steel became aware of and interested in the commercial potential of super-plastic steels. We spent time with Prof. Sherby of Stanford University who had conducted the basic laboratory scale research on this class of steels for a dozen years under the auspices of the Army Research Office. Believing that the potential of such steels was great, but recognizing that considerable work would be required to scale-up this material to commercial scale from bench scale, we approached the Tank Automotive Command. We thought they might probably be aware of this work, so offered to assist in producing commercial scale material for test and evaluation for critical properties such as wear resistance and forgeability.

To our surprise, they were unaware of the work sponsored by their sister organization and, of course, we got nowhere with them. The much happier sequel is that we have finally formed a consortium with Ladish, Caterpillar and Lawrence Livermore Lab under the Steel Initiative umbrella to proceed with this development. That only took a year.

Thus, we appear to have several serious problems:

1. Difficulty in moving from basic research to commerical reality.
2. Lack of direction and coordination of steel-related research by various government and university laboratories.
3. An inefficient scattering of physical facilities for pilot scale development among many locations.
4. An inefficient scattering of funding.

I was concerned as I reached these conclusions that perhaps I was being too harsh, but then I was able to take comfort from the paper written by Victor Radcliffe at an AIME meeting in 1984. In that paper entitled "Foresight, Materials Research and National Policy," he said that "Those of you who have spent any time in the Federal government will find it hard to match the actual practice of government policy with the formal definition of policy as intelligently directed action towards consciously determined goals, as distinct from aimless drift and blind faith." After reviewing all the various materials policy studies from COSMAT on and comparing them to actual performance he concluded:

1. That total federal funding for materials research and development had barely increased from 1976 through 1983 and had decreased 30% in constant dollar terms, and
2. It was obvious that there had not been a change in government spending emphasis, corresponding to the recommended priorities, even though industry had changed its priorities. In other words, business as usual on the old pet projects.

One factor that contributes to the lack of communication and practicality in steel research is the obsession of university researchers with developing only new or fundamental data that can be published. As the former head of a university school of metallurgy, I'm aware of the pressure to "publish or perish." I also know that within many university metallurgical schools it's a liability to publish practical research. Practical research often doesn't meet the requirements for publication in a prestigious peer-review publication like Metallurgical Transactions.

The attitude of many faculty members, which also is reflected in the university's incentive structure, is to explore knowledge for its own sake and to disseminate research findings through publication. Industry managers, on the other hand, tend to be concerned primarily with products that have commercial applications.

One administrator of a university research and technology park accurately summarized other obstacles that inhibit transfer of basic research to the private sector in a recent Conference Board Study. He wrote:

"Consulting with industry is not an important criterion for promotion, merit increases, or tenure in the university system. In fact, most universities have explicit or implicit policies against it. The same is true with applied research and contract research with respect to industry. It is not encouraged and does not receive the same kind of positive evaluation that basic research does."

Please don't misunderstand me. These are good people, well-grounded in the theory of their profession. However, most lack the practical industrial experience that would allow them to understand more fully the research results that industry needs from the projects they fund. I would like to see the majority of university metallurgists spend a minimum of two years working full-time in industry. That exposure would prepare them to design research within the university setting that would help advance the practical art of steelmaking, processing and application.

In Canada, the National Research Council encourages coordination of university research with industry, and schools of metallurgy prefer and seek faculty members with solid backgrounds within the steel industry. As a result, virtually all of the top academic experts used by the process side of the steel industry are from Canadian schools.

A recent Conference Board Study of "The Keys to U.S. Competitiveness" noted that business should assist university engineering departments with curriculum development by providing insights into industry's technological needs. It also contained the recommendation that "universities could be of more aid if they concentrated on real world problems. They need to be much more involved with typical industrial R&D problems, so that when they face a decision point they can take a path that may have a solution to an industrial problem at the end. They should concentrate on increasing the product-development skills of engineers and scientists." I would add that the same could be said of government scientists and laboratories.

I am not opposed to a certain amount of basic or undirected research, particularly at universities such as those supported by NSF. But a little direction and a lot more practical knowledge on the part of faculty could make such research far more useful than it often is.

Another example of research that is out of the mainstream of industrial usefulness is the $2 million a year that the Bureau of Standards spends on ostensibly relevant research. It is conducting research and development without using the advice it sought from producers and steel users. Ignoring suggestions from those two groups about how to focus steel research makes 99 percent of the research done by the Bureau of Standards irrelevant to market needs, in the opinion of industry experts who have reviewed their work.

At North Star Steel we support research that can be applied to our business both today and in the future. Our lean-and-mean philosophy, however, makes us believe research and development with clear, theoretically attainable and commercially useful goals is important. Knowledge by researchers of the limitations of raw materials, economic effects of processing variables and potential problems of scaling-up production is absolutely essential if the research is to be useful. This year we'll spend $1-million dollars on development work that we believe will result in new processes to meet the needs of customers. We are committed to meeting customers' needs, including lower-cost materials, the goal of research.

The challenge is to identify what needs are to be met, to set the requirements and then find solutions. That's research. What's most important about the quality of research is the attitudes of the people who do it and the direction in which it is aimed.

To quote the Conference Board Study again, "Another change involves a recognition that the line between basic and applied research is blurring and that greater interaction is needed between basic research and technology development.

"We have come to realize that the innovation process is not sequential. That is, pure science leading to technology and then to economic opportunity. It involves strong coupling--both ways--between technology and basic science. Each is stimulated by, and dependent on, the other."

This is not happening in research funded by the Federal government. So if we in the U.S. have these problems, what is the competition doing?

Historically, the British Iron & Steel Research Association (BISRA) helped make the United Kingdom a leader in steel production during the 1950s and 1960s. That association operated a very active pilot-plant laboratory that was funded by check-off type support from individual companies. They contributed a set amount for each ton of steel sold.

BISRA was discontinued in the early 1970s when British steel producers went through a restructuring and cost-cutting process similar to the U.S. industry's recent experience. At that time, British steel capacity exceeded U.K. demand by 50 percent and labor-union-driven employment practices had made it uncompetitive, but its mechanism for focusing research was successful. While BISRA existed, it had tremendous influence on advancements in steel technology.

Examples of other competitor nations with practically-focused, government-funded laboratory research for steel include France's IRSID organization; Belgium's CRM; West Germany's German Professional Metallurgy Society (VDEH), which does a mixture of contract and government-funded research, as well as the Max Planck Institutes at several German Federal universities that do a combination of fundamental and developmental research in close conjunction with industry.

Additional centrally coordinated research is done by Italy's CSM government laboratory; Sweden's MEFOS, which does base-level, government-funded research and also contracts research for industry; Brazil's government-funded ABM research center; India's government R&D facility; and China's Beijing University for Iron and Steel Technology. Of course, the Soviet Union and most Eastern European countries have significant state-supported metallurgical research institutes with heavy emphasis on metal processing.

The Japanese have established major pilot facilities at a number of universities. Those facilities are staffed by industrial research engineers on loan to the facility. All the major Japanese companies also are members of a number of consortia focused on major materials technology, the most recent involving reo-casting. That consortium includes, incidentally, a major Japanese bank.

My point is that most of our competitors are doing coordinated, practically-focused, government-supported steel research--we aren't.

Failing to have a centrally located research and development organization and facility for steel and metal-working technology-development puts the United States permanently behind competitors. Those whose attitude is "We'll adopt the best new, proven technology" are consigning U.S. industry to remaining 5 years or more behind the leading edge of technology and its applications.

Therefore, it's my belief that we need to create a Steel Development Center in the United States. It could be done at no incremental cost to the U.S. government by redirecting a portion of money now spent at several U.S. Bureau of Mines Research Stations, some of the money spent by the DOD; money spent by DOE at various locations and in the Steel Initiative, some money spent by NBS and NSF, as well as by NASA and the Department of Transportation. Those funds, which Battelle estimates could total $219 million, could provide as much as $100 million operating subsidy for the Center. Industry also could contribute funding, perhaps through contract research or a check-off for each ton sold.

Such a Center should be operated by an independent Board of Directors and administered by persons with experience at running multi-client projects with commercial goals. The majority of the Board of Directors of the Center should come from steel- consuming industries and steel-producing companies both of which should be represented. Direction should not be by any government agency or any university, although representatives of these sectors might also serve on the Board of Directors. Direction and choice of projects would be based on mutually agreed upon and well-defined goals and could include basic research if it would support the ultimate commercial goals. An example of such an organization, funded by and reporting to the Federal government, is the Gas Research Institute.

The equipment for such a Center, and sites, are available at various locations throughout the country. The current problem is that the equipment is scattered and under-utilized. Most of the equipment is owned by existing government agencies or universities, none of which are thoroughly integrated to carry out meaningful new product or process scale-up work. The equipment needs to be centralized so melting, refining, casting, rolling, forging, coating and other work can be done so that properties and economics of new processes and products can be evaluated on full or pilot scale. U.S. Steel at Monroeville had that capability, as did Bethlehem at Homer Labs.

There is a genuine need for a good national laboratory on steel and metal processing. Such a facility could be financed with already existing funds, it could be assembled at little extra cost and operated at no extra cost. But, it requires making hard decisions about how serious we are about making the U.S. steel and metalworking industry more truly competitive. It also will require decisions to discontinue unneeded research currently being done and to reallocate funds for that purpose.

I believe S-2470 begins to address these problems. It directs coordination between the Bureau of Standards and Department of Energy steel research. It addresses the needs for proprietary rights flowing to those who need an incentive to commercialize the results. Unfortunately, it still leaves in place management by the government; it does not address the issue of involvement by steel-consuming industries, and ignores the efficient use of pilot-plant capital equipment. It also is too specific in defining priorities. I do not believe that level of specificity belongs in legislation.

The federal government's role should be to mobilize the various factions doing steel research into a cohesive organization dedicated to rekindling the competitiveness of U.S. steelmakers and their customers. Establishing a national Steel Development Center with pilot-plant capabilities would greatly aid technology transfer. The equipment and facilities all exist somewhere. So does the budget, if proper reallocations are made. Any new initiatives in U.S. steel research should emphasize goals based on real-world needs of both steel producers and steel users. Not involving those two groups will consign the United States to remaining far from the leading edge of steel research and techonology development. The present system is a disaster. Worse, it is a waste. Let's try a better tack. Thank you.

Mr. **Walgren**. Thank you very much, Mr. Collins.

Let me just ask quickly, Mr. Lunt, if you would comment a little bit on what it means when we stay out of international standards organizations. Standards are hard for most of us up here to really appreciate, because we're not engineers and we don't really see how they affect the way business patterns move. Can you comment on the importance of our participating in these international standards bodies.

Mr. **Lunt**. Yes, Congressman Walgren, I would like to do that. Standards are the rules of the trade. The standards are the rules that the seller has to conform to, and the standards writing activity is proceeding whether the steel companies of the United States participate or not; the rules are being written by others, and if these rules turn out to be difficult for domestic producers to conform to, they will be at a competitive disadvantage to their competitors overseas. It seems to me that it is vitally important for the producers in the United States to participate in standards writing activities to be sure that the standards don't write them out of the market or increase their production costs.

There's another thing I'd like to point to. The withdrawal of the United States from international standardization became known world-wide because the AISI representative, who was managing our effort, wrote to the chairman of the ISO Steel Committee telling him that we were discontinuing our activity, and that sent a message world-wide that the United States didn't care what happened, didn't care what other countries were doing. It was a very bad message.

Mr. **Walgren**. Do we participate in other standards organizations based on Government funding? You've suggested that we ought to just put ourselves back in there through the Bureau of Standards or some entity.

Mr. **Lunt**. I'd like to clarify that. I did not suggest that the Government run the activity. The United States representative in ISO is the American National Standards Institute, ANSI, and ANSI has delegated ASTM to be their technical adviser, their consultant. So the work, the actual participants are the members of ASTM, the members of my committee, and there's a lot of people involved.

My recommendation is that the funding go to either of those two organizations, ANSI or ASTM, not to bring in a Government organization to run the show. It should continue to be private standardization, voluntary standardization activity.

Mr. **Walgren**. And my question is, are there other areas where we're funding it that way? Are there other participation in international groups, I guess, that are essentially funded by the Government as opposed to the various societies that we have?

Mr. **Lunt**. Not to my knowledge in the United States; in other countries, yes.

Mr. **Walgren**. Well, I certainly hope we can get back into those organizations.

Dr. Chatfield, someone said that the steel industry sees itself as a steel industry or as focused really rather solely on steel rather than materials, rather than being a materials industry. Can you comment at all about how a private company looks out there at the market, and admittedly you're in the steel business, but, as I understand it, Japanese companies are trying to look at advanced, I guess, new materials. U.S. Steel looked at oil. Does a private steel maker look at other materials at all?

Dr. **Chatfield**. Early in this decade, National Steel had maybe a wider range of businesses than we do today. It was involved in the aluminum business, and there was a portion of National Steel that was an aluminum company. We had in the past looked at magnesium, another material.

Early in the—as I say, early in the decade, National Steel Corporation reorganized itself into National Intergroup, and the steel portion of that—of National Intergroup was reidentified as National Steel Corporation.

The mission of National Steel Corporation, as we have defined it in our company, is to be a producer of high-quality steel products and steel-related materials. That is our mission that we have chosen within the overall—

Mr. **Walgren**. Would new materials qualify under steel-related materials? And I don't mean no steel. I mean there must be some—

Dr. **Chatfield**. No, no. As we define it, really, we're talking about coal and steel. Those are the kinds of products we deal in, it's our mission, and we are not looking outside of that. Now within that, however, we see our approach to the marketplace as being one where we must adapt the product we do make. Steel is steel, but it can come in a lot of forms.

I think one of the former witnesses talked about the fact that we must look, really, for the high-quality, high-value-added niches in order to survive, for steel companies to survive in the future, and that certainly is what we are doing. We are attempting to, if you want to call it, not diversity our product but specialize our product or a portion of our product into very high-quality coated products, galvanized products, iron-zinc alloy-coated products, to supply specific customer needs. We have devoted ourselves to being rather customer oriented and attempt to adapt our products.

So I guess to come back to your question, instead of looking outside of steel products, we view our mission as selling steel but adapting it in as many ways as possible to fit the needs of the marketplace today.

Mr. **Walgren**. You said in your testimony that National is making a pretty heavy investment in capital expenditures at present, and you also have this association with a Japanese maker as well. How does that play out? The investments that you're making in new capital equipment, are they affected by that relationship with the Japanese entity?

Dr. **Chatfield**. I think the answer to that question has to be yes. The association with Nippon Kokan is one that brings to our company a strong emphasis and dedication to improving the steel business. They are very dedicated to making a strong steel company. In order to do that, we are concentrating on several very important parts of our business, improving the productivity, improving the quality of our product. In many cases, that involves new facilities or improved facilities. The other is to improve the yield of of our operation.

In order to do those things, we are investing rather heavily in continuous casters. Our Great Lakes Steel Division is 100 percent continuously cast. Our corporation as a whole is 90 percent continuously cast, which is much higher than the national average for continuous casting capability. New steel-making equipment that we are putting in or steel, let's say, modification equipment—modification of the characteristics of the liquid steel—have been installed and are continuing to be installed in both of our primary divisions in order to make a higher quality product, in order to increase the productivity and the yield of the operation. All of these have an impact on the ability to supply our customer and to remain competitive in the business.

On the finishing side of the business, we are investing heavily in new coating facilities. We have recently installed an electrogalvanizing line to make exposed quality galvanized product for the automotive industry.

So I think the answer to your question is, our capital investments have been aimed at yield, productivity, and quality. The Japanese involvement with us has intensified our efforts to concentrate on those particular areas, and it's been a positive involvement.

Mr. WALGREN. At present, though, you are still quite short-term in your research focus, even day-to-day customer problems and the like, and you don't see the potential to engage in mid- to long-range product development? Is that a wrong thing to say, I guess?

Dr. CHATFIELD. Probably in the product development area we would be short-to medium-range, certainly not long-range.

Mr. Graham pointed out that in troubled times, or troubled economic times, managers have to trade off certain things and can only support certain activities within their organization. We are putting a lot of money into new equipment. We have put—we have retained probably a high fraction of the money we have spent on R&D, but in order to do that we have had to—in the R&D area—we have had to focus on the short to medium term and hope and look to other sources for the long-term R&D, and so our investments—if you want to look at it—are bringing us up to date with today's technology. In a way, it's a little bit of catch-up. When we get it done, we will be up to date with today's technology, but the need, as we see it and as I see it, is to provide for the future, and that's where the long-term R&D is very important.

Mr. WALGREN. Well, I hope we're trending in that direction governmentally as well.

Mr. Collins, you are saying that we need to be able to have a centralized and a cohesive organization with a board of directors that could discontinue some things and focus various elements of research that are ongoing now, and we hope we might have taken a little step in that direction with the trade bill and the recasting of the Bureau of Standards into Institutes of Standards and Technology.

We haven't really had the structural go-ahead to do research really in these areas, and we're either doing it indirectly because of the energy savings that could conceivably be found or the measurement qualities under the Bureau or something like that, and now with an Institute of Technology and particularly some focus on advanced technologies it may be that we can get this more focused mission pulled together. At least I hope that is the case.

I guess I don't really have a question because I like the endorsement that you made of the importance of what is going on in the Government right now, and I guess when you look back on all the witnesses, there is, certainly in that long-range area, in varying degrees from willingness to some real stress on importance of a Government-private sector partnership in long-range research, and I guess I wonder whether that is different than some time ago. I can't quite remember. We've had not that expression in the past. We've had instead large parts of the system really resisting and say, "Well, no, you should not," and that is not the tone that has come out of these hearings. Could you respond to that?

Mr. Collins. That is correct, Mr. Chairman. I think there have been advances. Certainly the NBS has been doing some excellent work in sensor research.

But Dr. Geiger was speaking from his own experience. North Star Steel had discussed with Army Research—Central Army Research the potential for developing superplastic steels, an exciting, potentially new steel product with strength and lightness. The North Star Steel people went to the Army Tank Command, but the Army Tank Command had no idea that Central Army Research was interested in superplastic steel. North Star Steel wasted about a year talking to the Army Tank Command, but finally North Star Steel was able to form a consortia involving itself, Caterpillar Tractor Company, Ladish Company, and the Lawrence Livermore Lab within the framework of the Steel Initiative Program to undertake an effort to develop superplastic steel, which program is now just getting underway.

But the essential point is that one part of the Government is pursuing research in a vacuum and another part of the Government is pursuing its own research program in a vacuum and although occasionally talking to industry, then reverting to what it wants to do. That is why we believe that if an industry like the gas industry can have a Gas Research Institute reporting to the Federal Government, why can't we envisage the possibility of establishing a central steel research program involving the steel users and the producers and the Government in such a way that available funds would be centralized, expenditures would be carefully assessed, Government decisions would be based on recommendations from the commercial elements of use and production and then the potential for commercialization of what evolves from that research effort would be pretty good, we believe. That is our concept, and that is what we have attempted to propose here today. We shall also be proposing this to other Congressional committees in the future.

Mr. Walgren. Okay. Well, all right. Well, thank you all very much for your patience and for your contribution to the record. We appreciate it as a subcommittee and look forward to talking with you in the future and hope you'll continue to be a resource to us. Thank you very much.

[Whereupon, at 1:25 p.m., the subcommittee was adjourned.]

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